DOUGLAS COUNTY
COLORADO

Roadway Design and Construction Standards

Appendix A

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CONCRETE JOINTS	SP.32
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INLET - TYPE D	SP.36a, SP.36b, SP.36c
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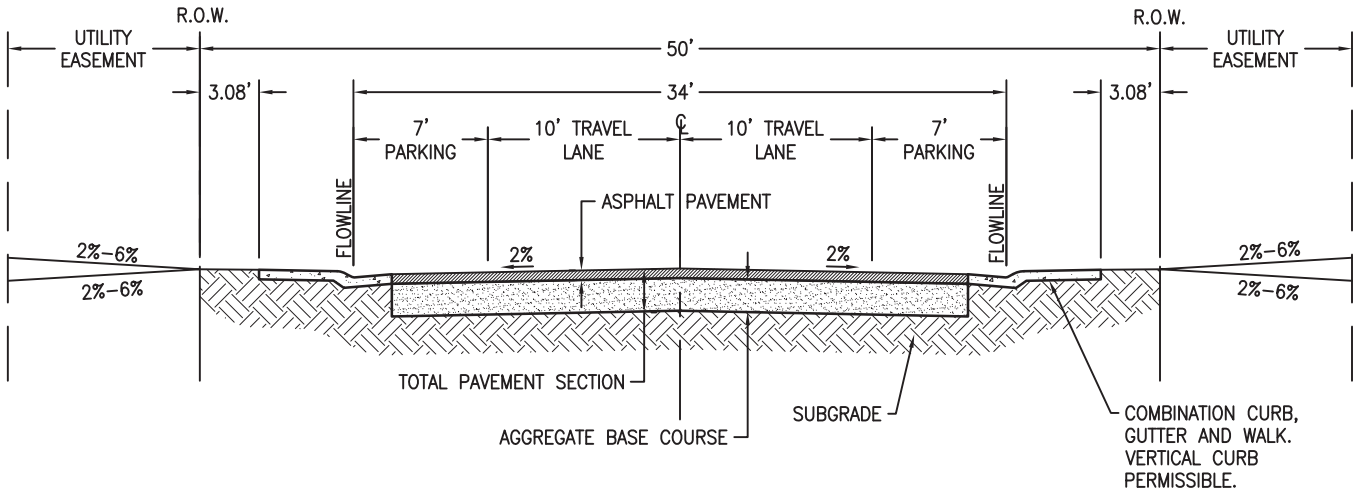
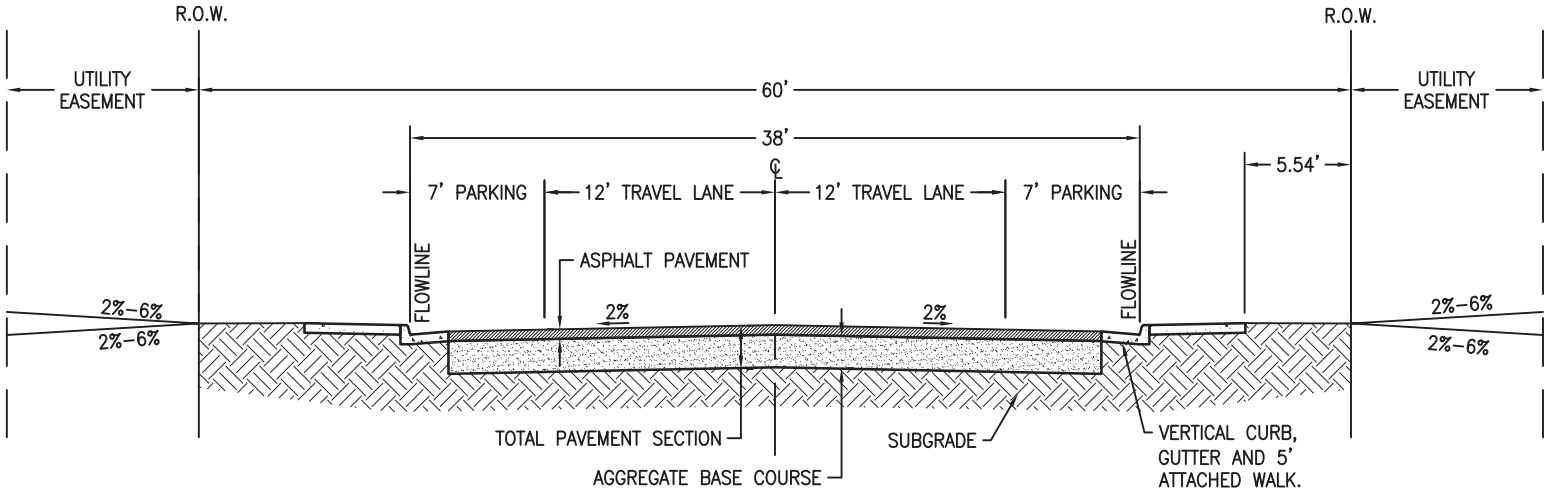
CUL-DE-SAC & URBAN LOCAL
TYPE I

DOUGLAS COUNTY
COLORADO



SINGLE FAMILY



MULTI FAMILY

Issued: 05/2013
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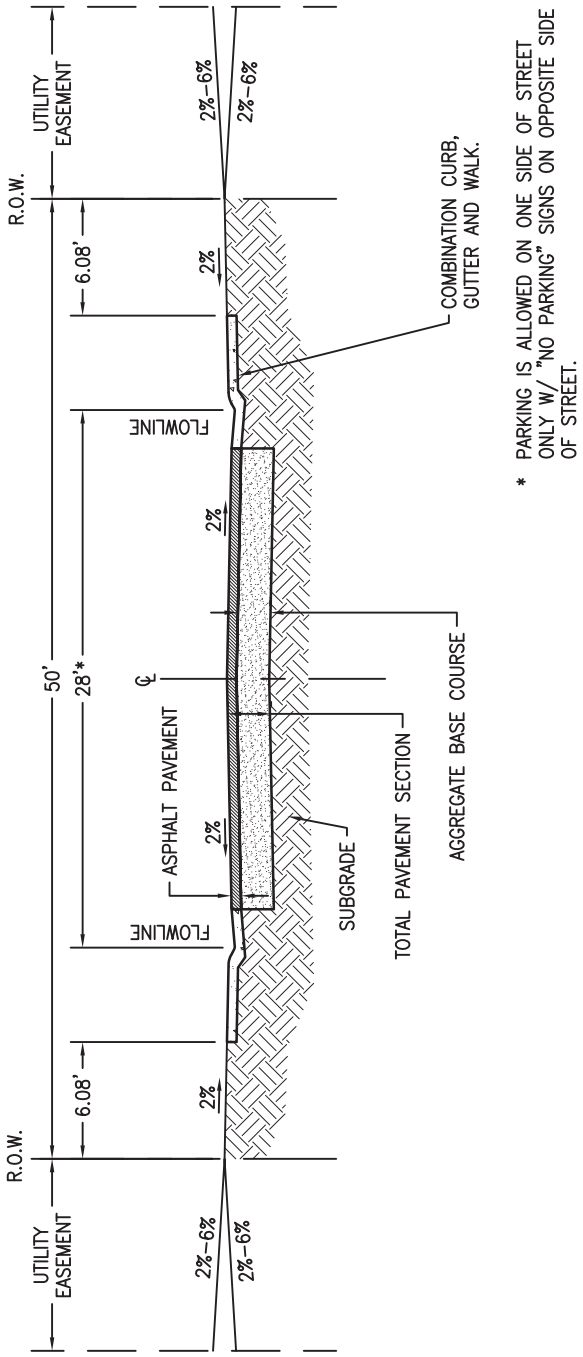
Drawing No.
SP.1



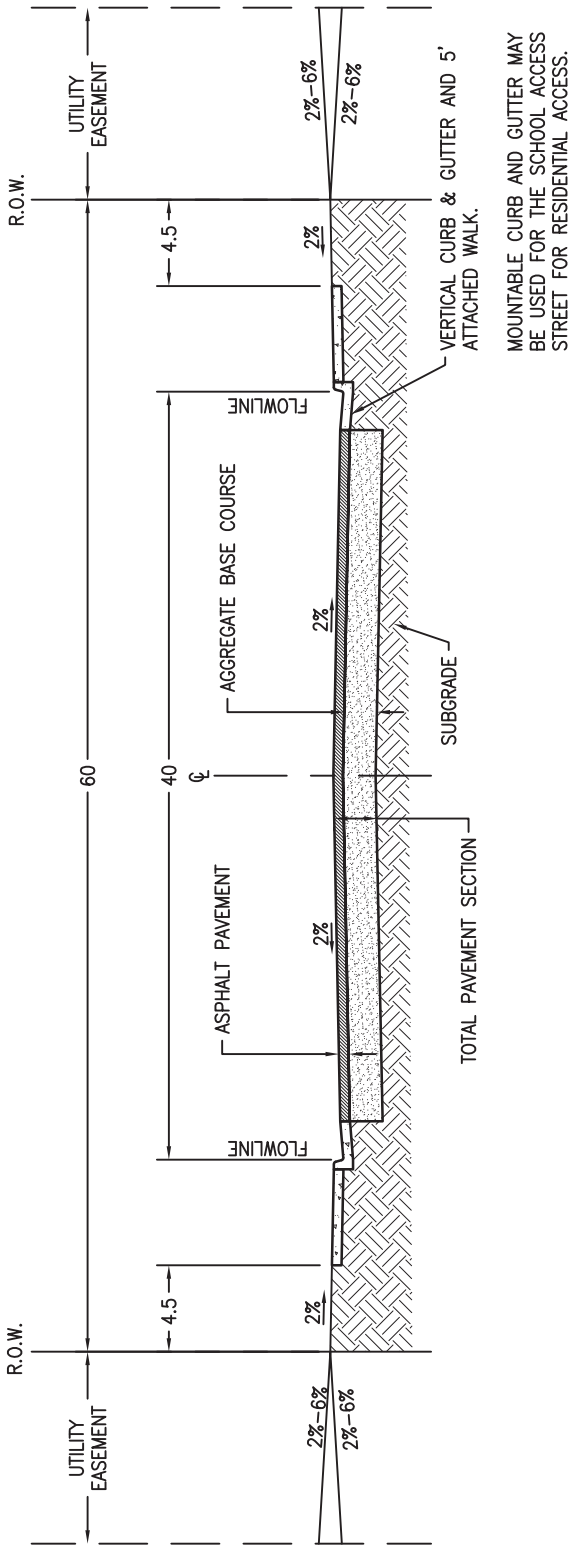
URBAN LOCAL TYPE II

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

Drawing No.
SP.2



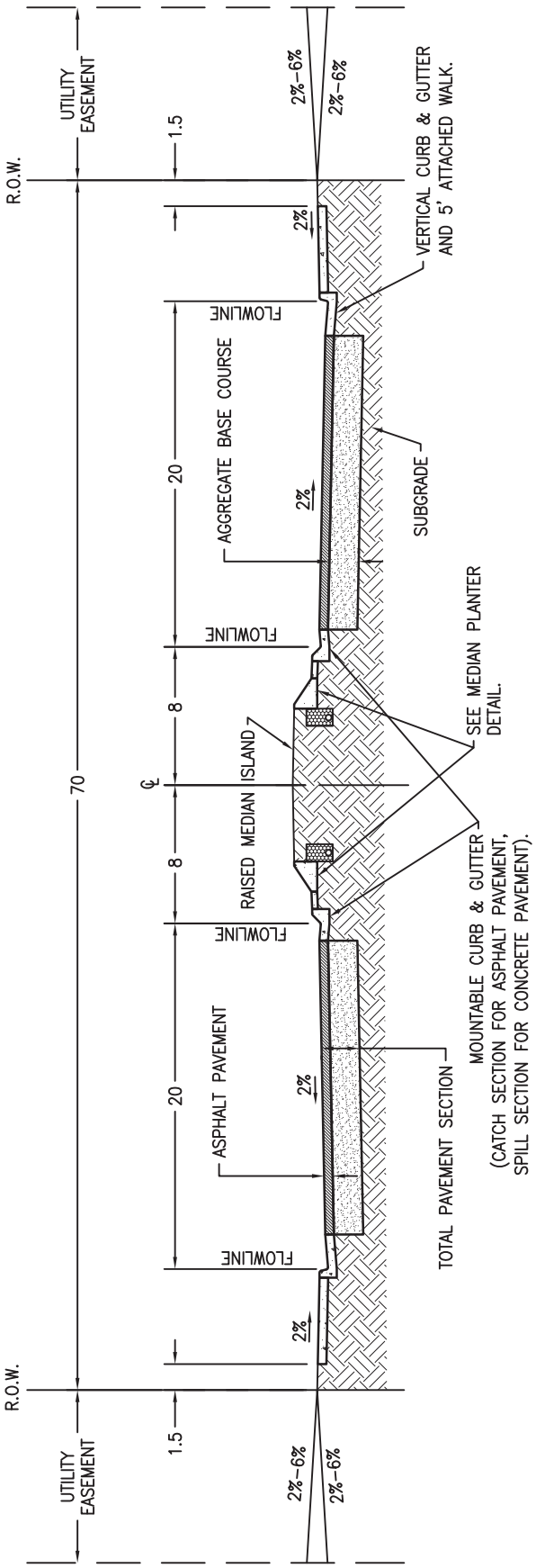
ENTRY STREET, SCHOOL ACCESS STREET & COMMERCIAL AND INDUSTRIAL

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised: _____

Drawing No.
SP.3



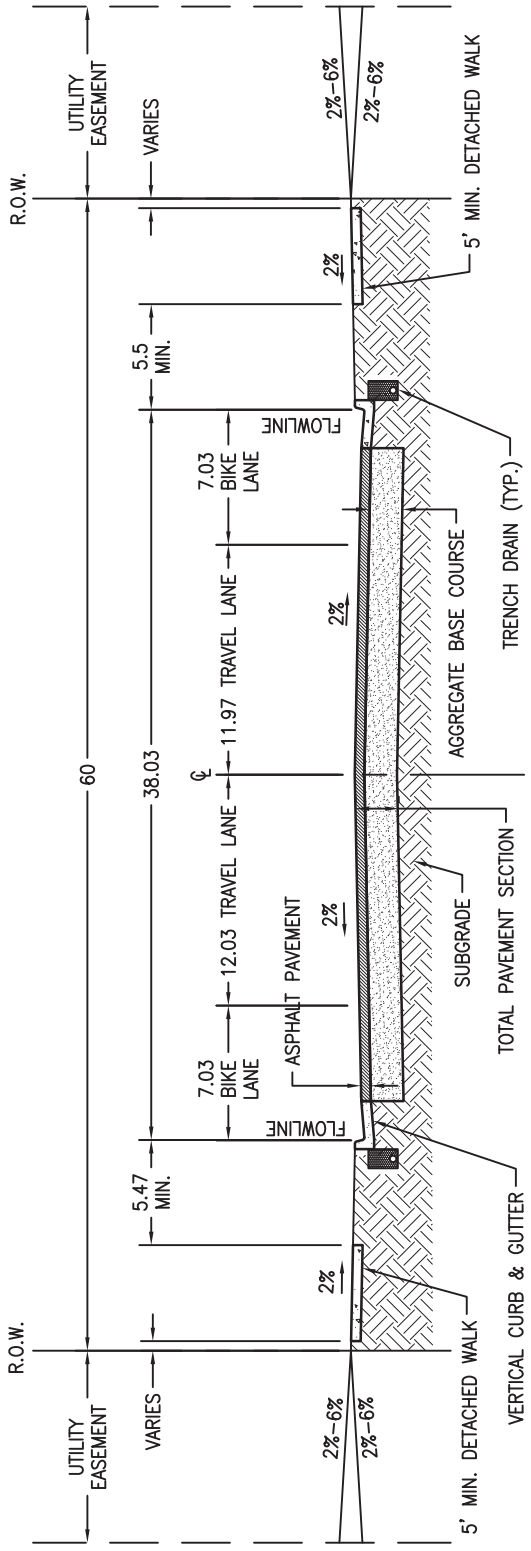
ENTRY STREET WITH MEDIAN

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised: _____

Drawing No.
SP.3a



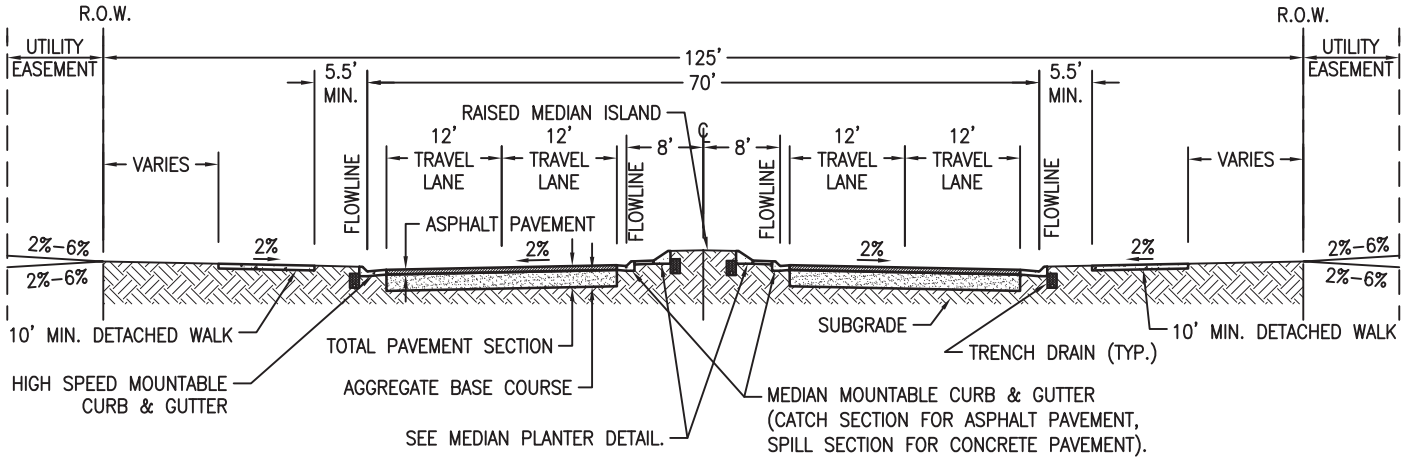
URBAN COLLECTOR

DOUGLAS COUNTY
COLORADO

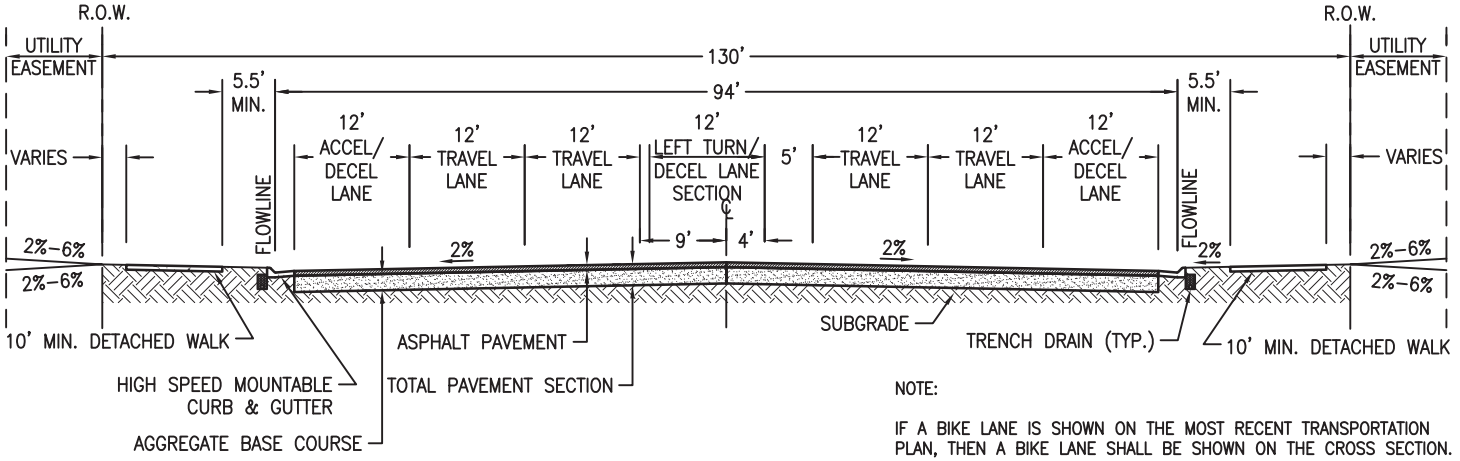
Issued: 05/2013

Revised:

Drawing No.
SP.4



ROAD SECTION



NOTE:

IF A BIKE LANE IS SHOWN ON THE MOST RECENT TRANSPORTATION PLAN, THEN A BIKE LANE SHALL BE SHOWN ON THE CROSS SECTION. ADDITIONAL RIGHT-OF-WAY MAY BE REQUIRED AT INTERSECTIONS.

INTERSECTION

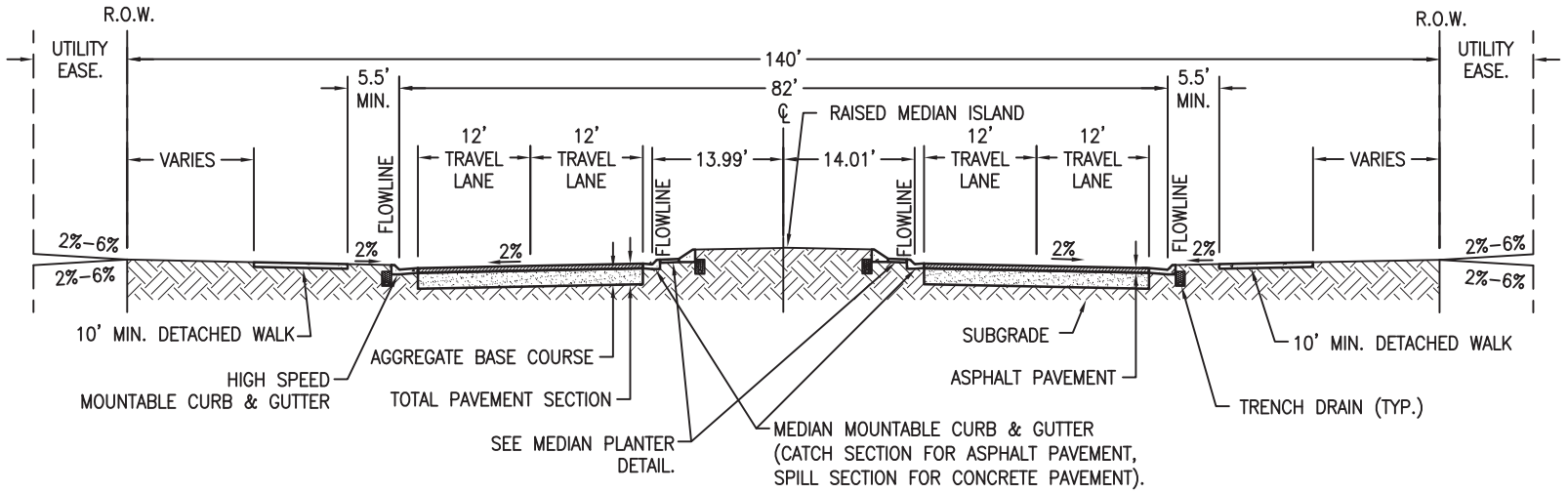
DOUGLAS COUNTY
COLORADO

MINOR ARTERIAL

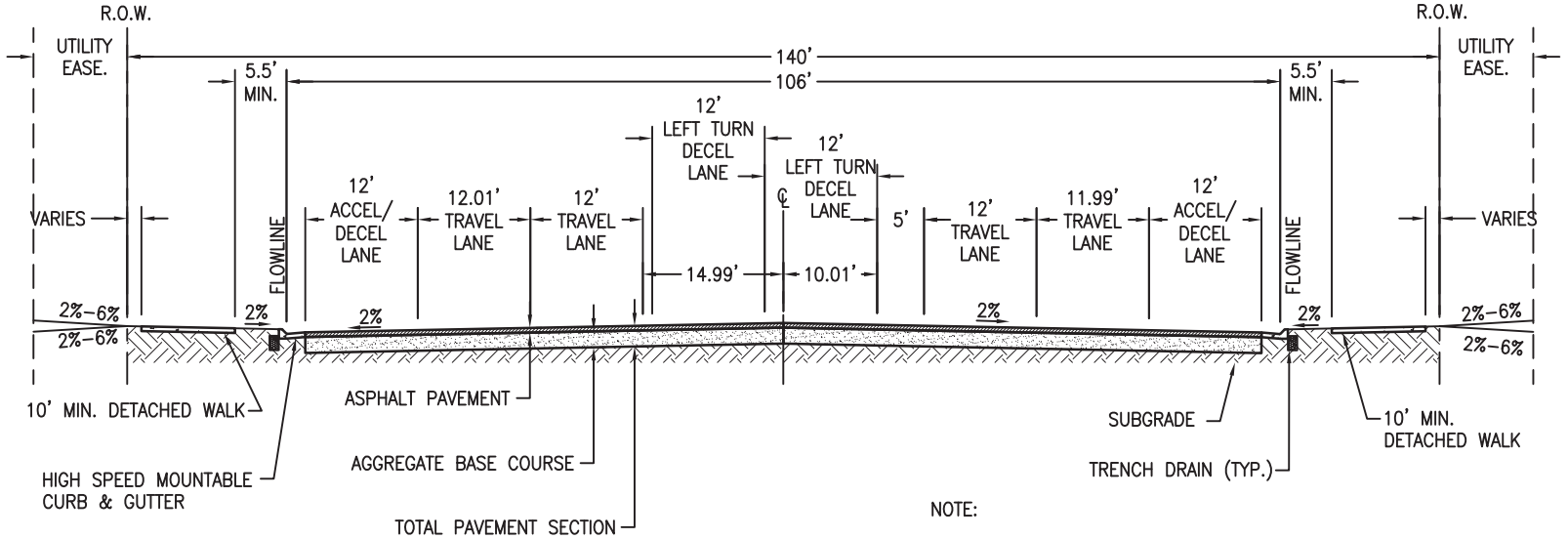
Issued: 05/2013

Revised:

Drawing No.
SP.5



ROAD SECTION



NOTE:

IF A BIKE LANE IS SHOWN ON THE MOST RECENT TRANSPORTATION PLAN, THEN A BIKE LANE SHALL BE SHOWN ON THE CROSS SECTION.
ADDITIONAL RIGHT–OF–WAY MAY BE REQUIRED AT INTERSECTIONS.

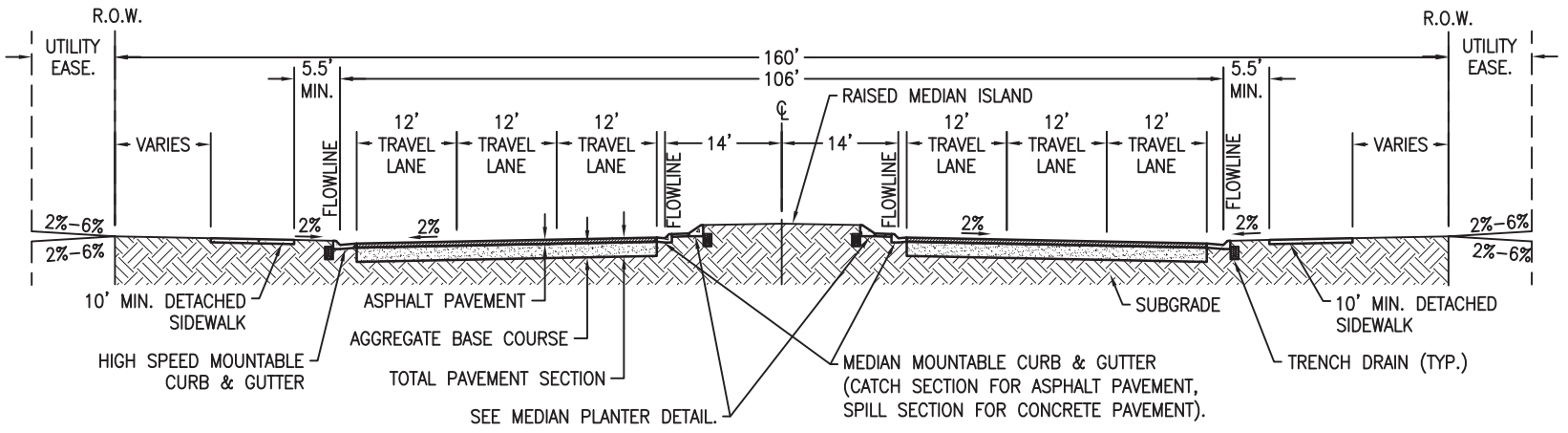
INTERSECTION

DOUGLAS COUNTY
COLORADO

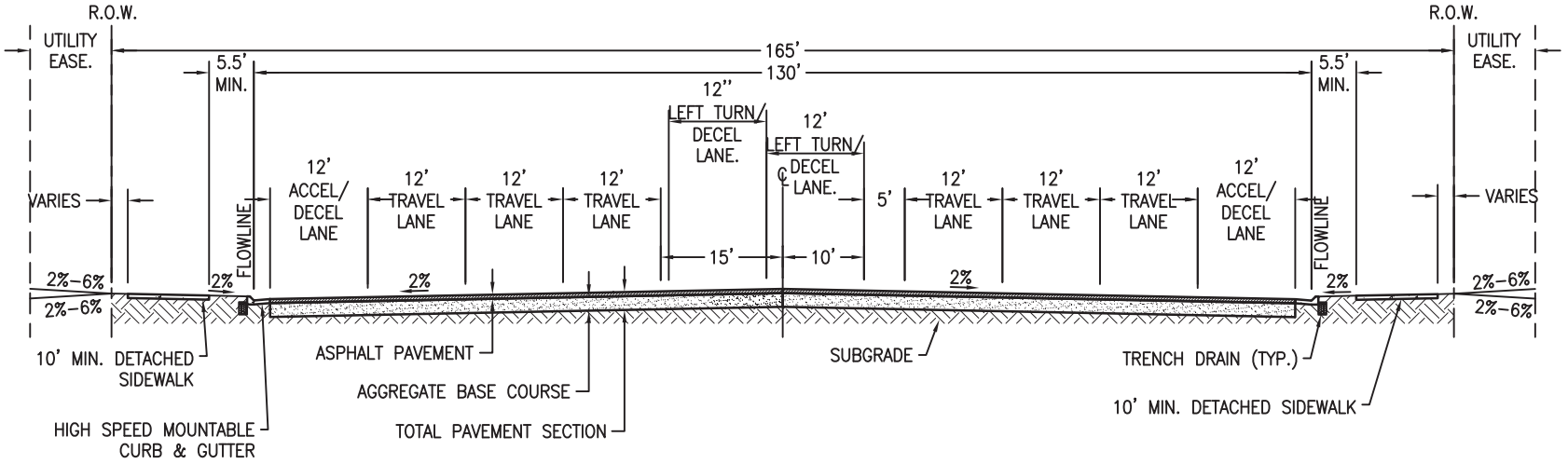
MAJOR ARTERIAL 4 LANE

Issued: 05/2013
Revised:

Drawing No.
SP.6



ROAD SECTION



NOTE:

IF A BIKE LANE IS SHOWN ON THE MOST RECENT TRANSPORTATION PLAN, THEN A BIKE LANE SHALL BE SHOWN ON THE CROSS SECTION.
ADDITIONAL RIGHT–OF–WAY MAY BE REQUIRED AT INTERSECTIONS.

INTERSECTION

DOUGLAS COUNTY
COLORADO

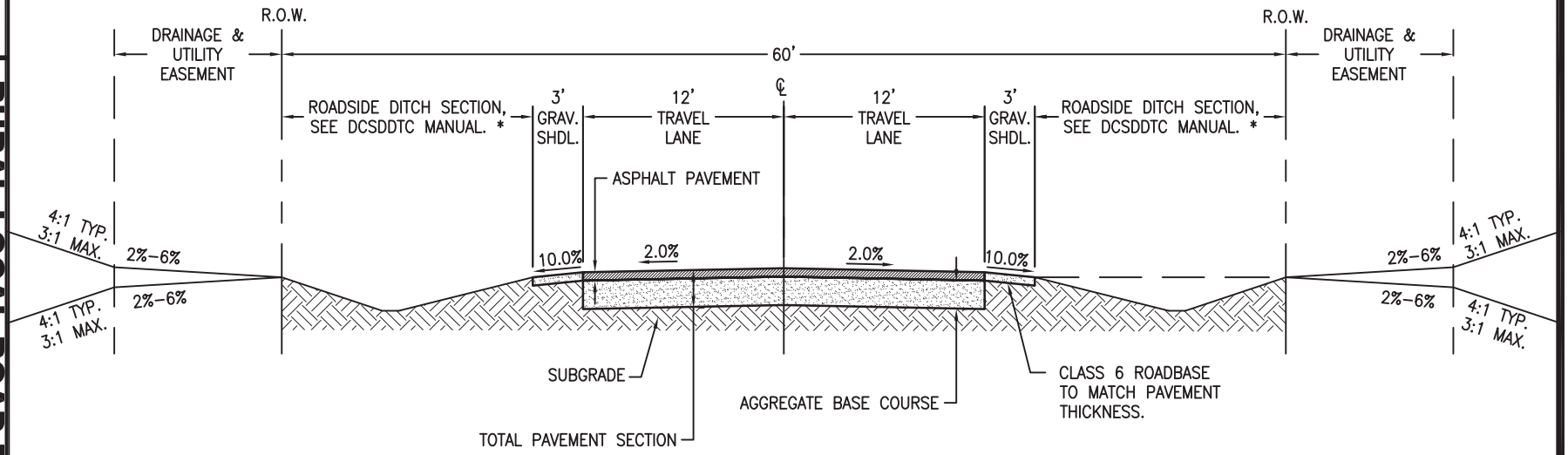
MAJOR ARTERIAL 6 LANE

Issued: 05/2013
Revised:

Drawing No.
SP.7

RURAL LOCAL ROAD TYPE I
(GRAVEL SHOULDERS)

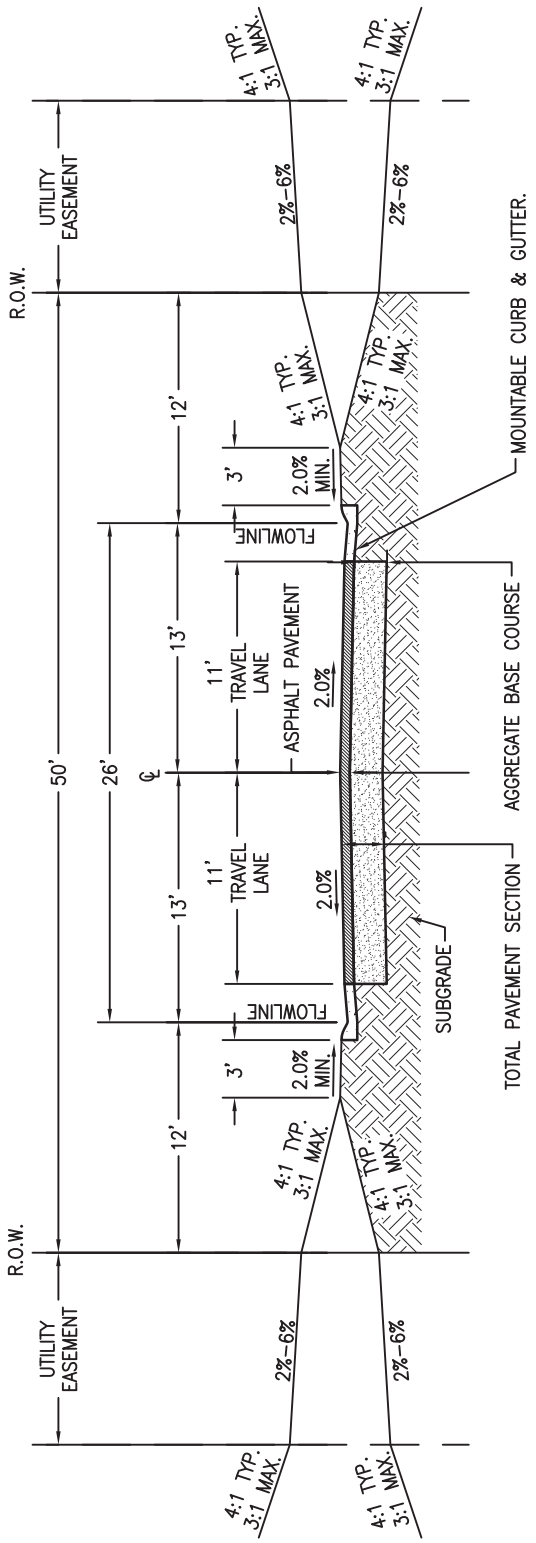
DOUGLAS COUNTY
COLORADO



* ROADSIDE DITCH MAY NOT BE REQUIRED IF THERE ARE NO CUT SLOPES ALONG THE ROADWAY.

Issued: 05/2013
Revised: 09/2015

Drawing No.
SP.8



RURAL LOCAL ROAD TYPE II (MOUNTABLE CURB & GUTTER)

DOUGLAS COUNTY
COLORADO

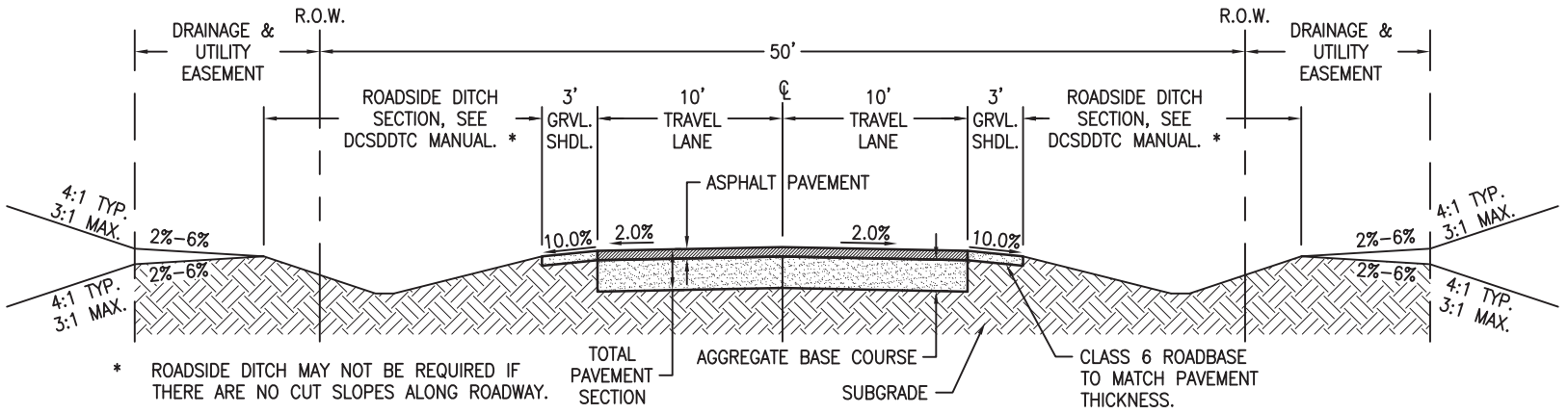
Issued: 05/2013

Revised:

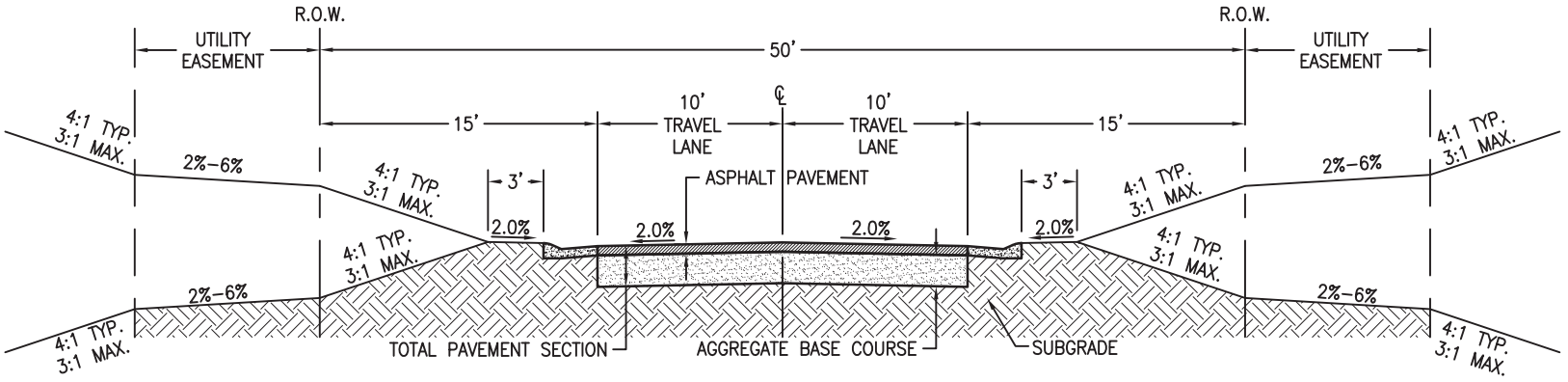
Drawing No.
SP.9

RURAL LOCAL TYPE III
(LESS THAN 400 VPD)

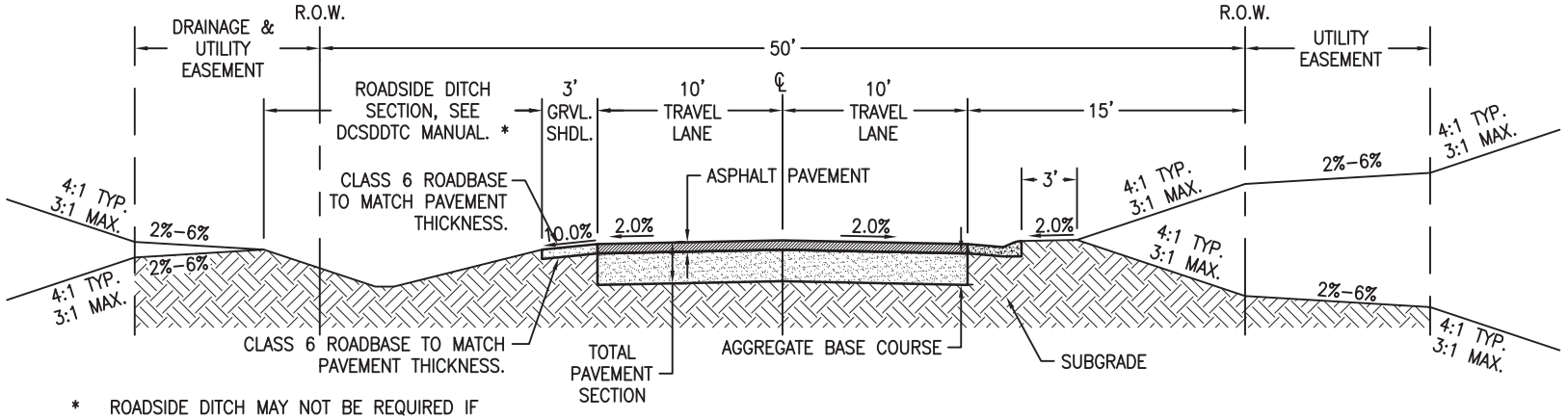
DOUGLAS COUNTY
COLORADO



3' GRAVEL SHOULDER WITH ROADSIDE DITCH



MOUNTABLE CURB AND GUTTER



COMPOSITE

Issued: 05/2013
Revised: 09/2015

Drawing No.
SP.10

* ROADSIDE DITCH MAY NOT BE REQUIRED IF THERE ARE NO CUT SLOPES ALONG THE ROADWAY.

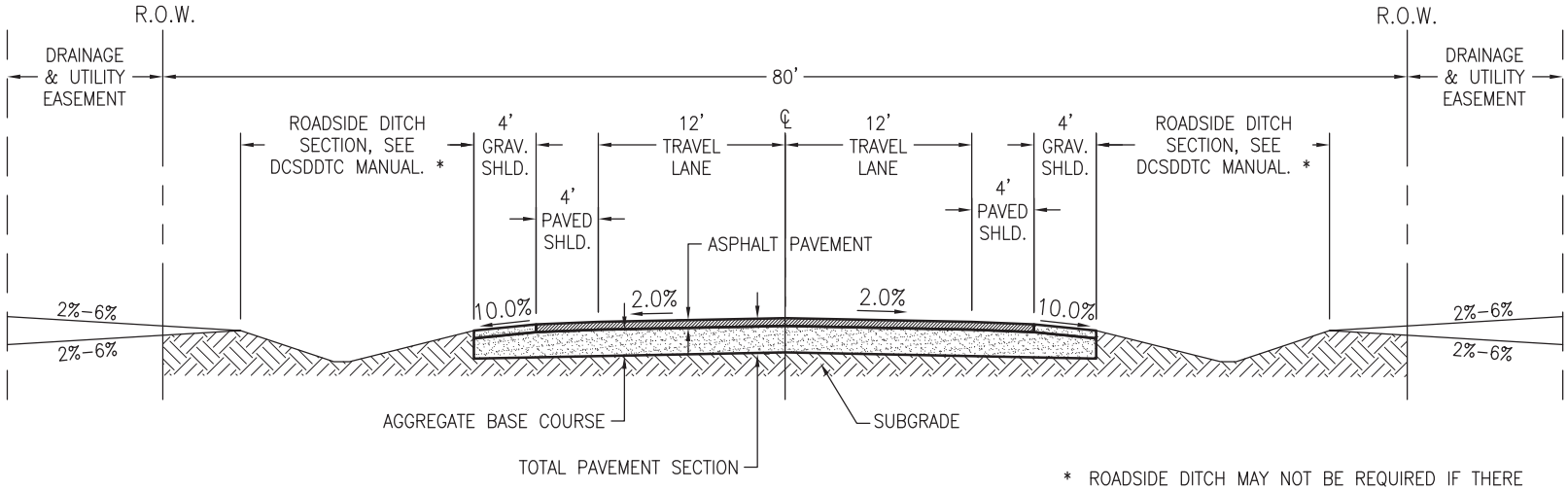
RURAL LOCAL TYPE IV (LESS THAN 100 VPD)

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

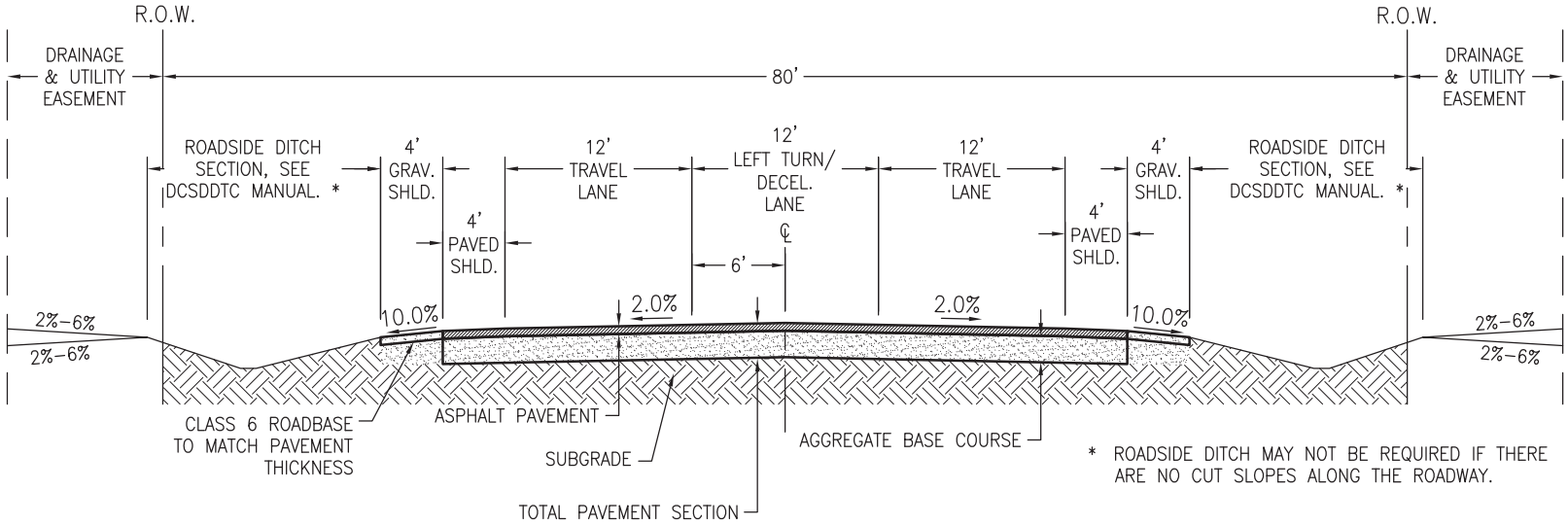
Revised: _____

Drawing No.
SP.11



* ROADSIDE DITCH MAY NOT BE REQUIRED IF THERE ARE NO CUT SLOPES ALONG THE ROADWAY.

ROAD SECTION



* ROADSIDE DITCH MAY NOT BE REQUIRED IF THERE ARE NO CUT SLOPES ALONG THE ROADWAY.

INTERSECTION

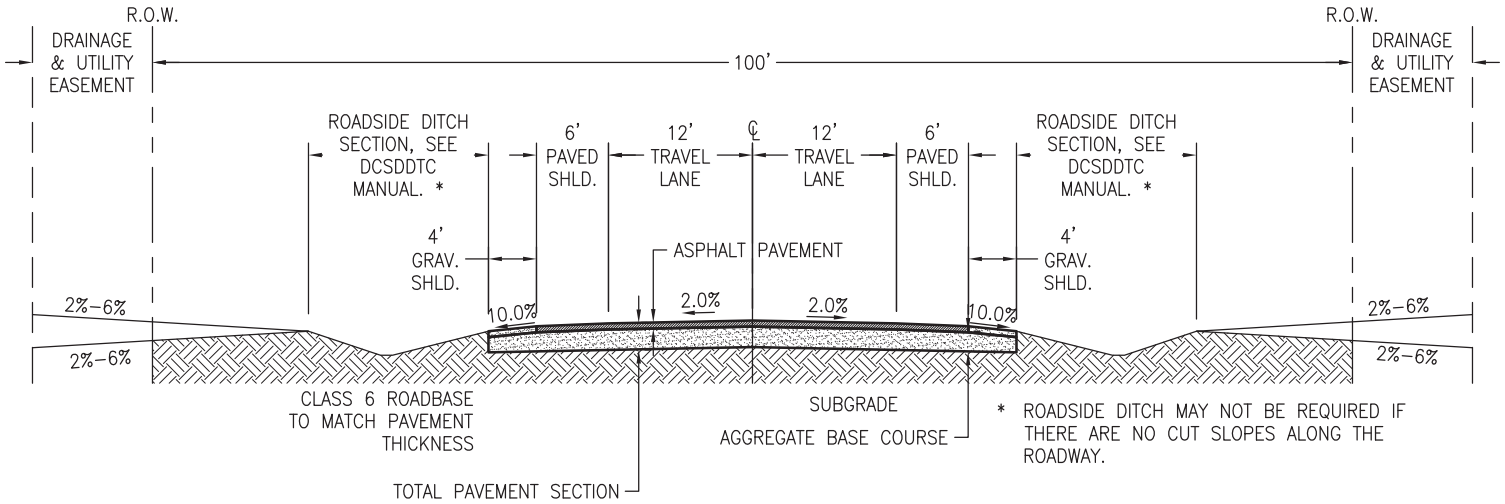
RURAL COLLECTOR (NO PRIVATE DRIVE ACCESS)

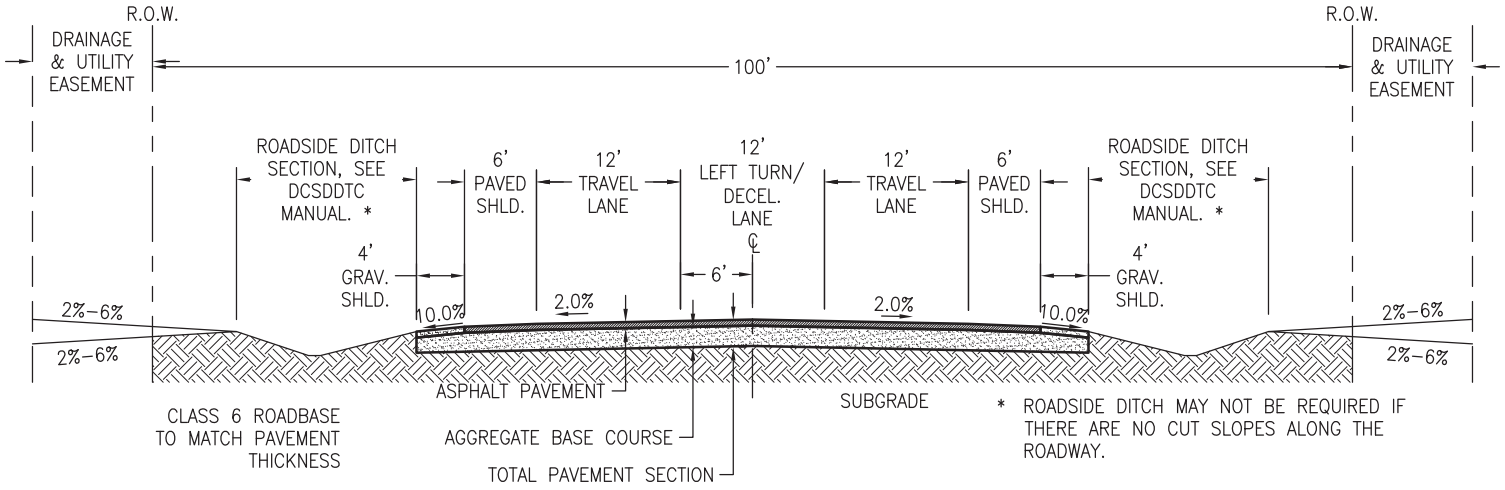
DOUGLAS COUNTY COLORADO

Issued: 05/2013

Revised: 01/2019

Drawing No. **SP.12**



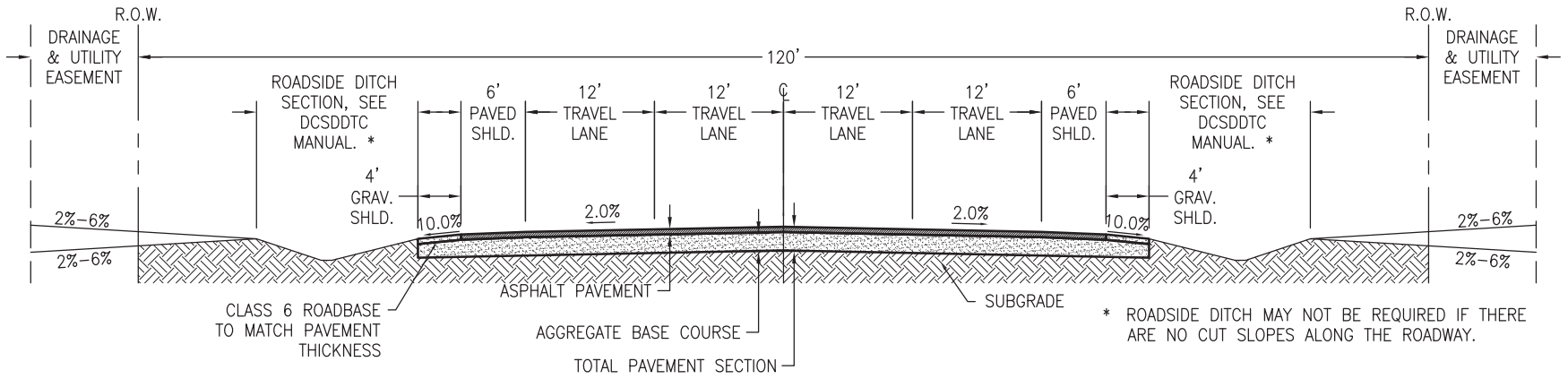


RURAL ARTERIAL - 2 LANE (NO PRIVATE DRIVE ACCESS)

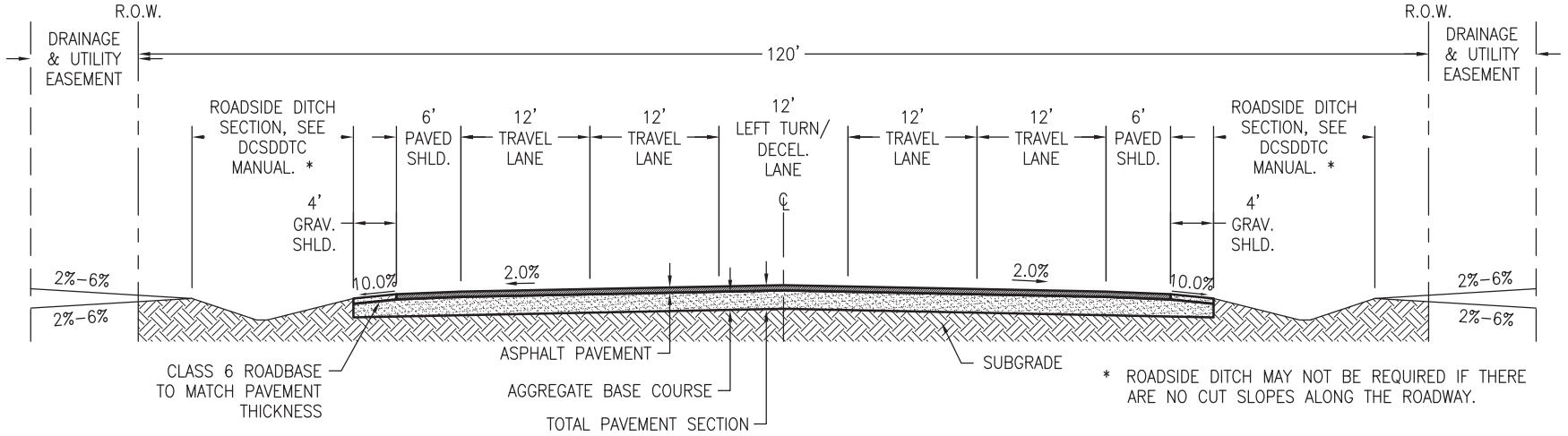
DOUGLAS COUNTY
COLORADO

Issued: 05/2013
Revised: 01/2019

Drawing No.
SP.13



ROAD SECTION



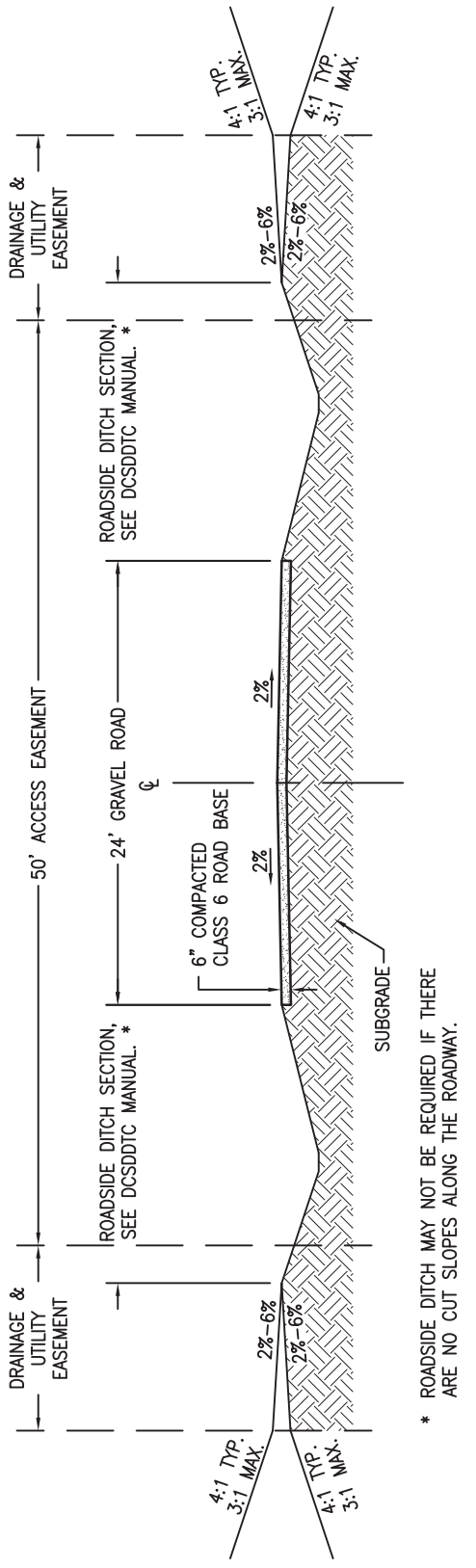
INTERSECTION

DOUGLAS COUNTY
COLORADO

RURAL ARTERIAL - 4 LANE (NO PRIVATE DRIVE ACCESS)

Issued: 05/2013
Revised: 01/2019

Drawing No.
SP.14



35-ACRE PRIVATE RURAL ROAD

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised: _____

Drawing No.
SP.15

THE FOLLOWING NOTES ARE APPLICABLE TO ALL ROADWAY SECTIONS IDENTIFIED ON THE PREVIOUS PAGES (LOCALS, COLLECTORS, ARTERIALS AND RURAL ROADWAYS), UNLESS MODIFICATIONS ARE APPROVED IN WRITING BY THE DIRECTOR OF PUBLIC WORKS.

NOTES:

1. GUTTERS SHALL BE AT LEAST 6" THICK.

2. ALL CURBS SHALL USE THE CATCH SECTION UNLESS OTHERWISE NOTED.

3. ALL COMBINATION CURB, GUTTER AND SIDEWALKS TO BE 6" THICK (MIN.). SIDEWALKS WITH VERTICAL CURB AND GUTTER TO BE 6" THICK (MIN.).

4. NON-LANDSCAPED MEDIAN ISLANDS SHALL BE COVERED WITH AN ACCEPTABLE IMPERMEABLE SURFACE.

5. IF ANY SECTION OF A DETACHED SIDEWALK IS TO BE PLACED OUTSIDE OF THE ROAD RIGHT-OF-WAY, THEN A SIDEWALK EASEMENT SHALL BE REQUIRED TO MAINTAIN PUBLIC USE.

6. TOTAL PAVEMENT THICKNESS TO BE DETERMINED BY PAVEMENT DESIGN PROCEDURES IN CHAPTER 5.

PLACEMENT, MOISTURE AND DENSITY CONTROL FOR SUBGRADE, SUBBASE, AND SURFACING MATERIALS SHALL BE IN CONFORMANCE WITH THE REQUIREMENTS OF CHAPTER 8.

8. GUTTER THICKNESS SHALL BE INCREASED TO MATCH CONCRETE PAVEMENT THICKNESS.

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

DATE 10/1/2021

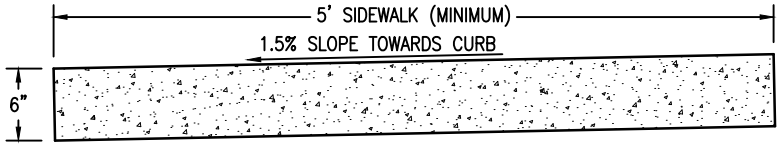
ROADWAY NOTES

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

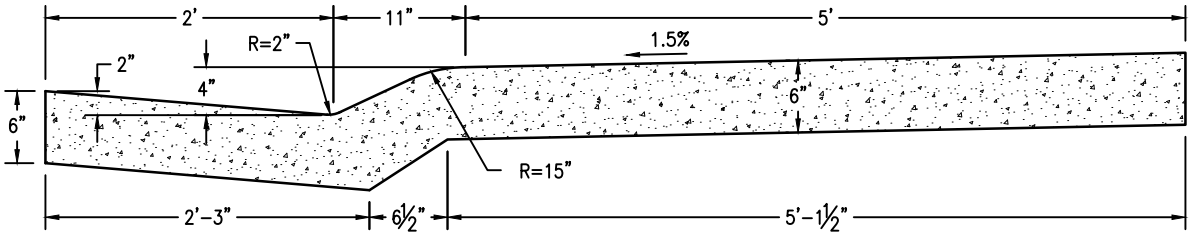
Revised: 10/2021

Drawing No.
SP.16

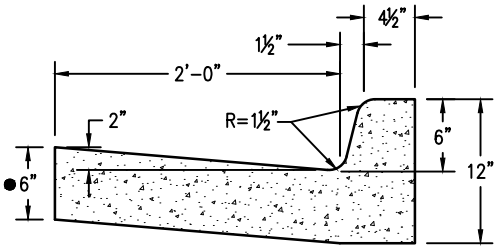


IF USED FOR PEDESTRIAN/ BICYCLE COMBINED SIDEWALK, WIDTH SHALL BE 10'.

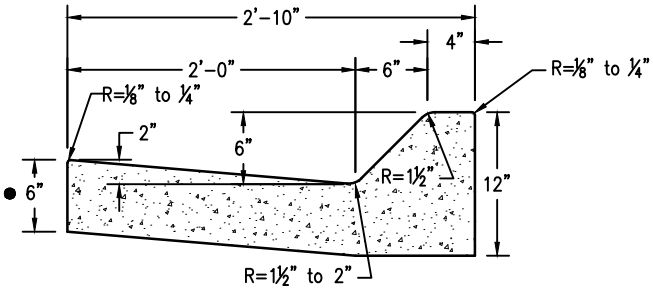
STANDARD ATTACHED OR DETACHED SIDEWALK



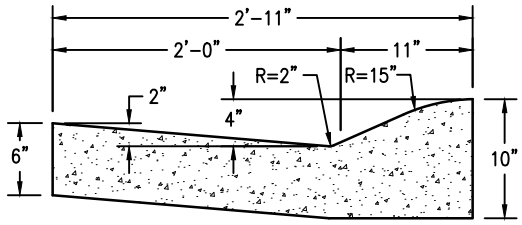
COMBINATION CURB, GUTTER & SIDEWALK



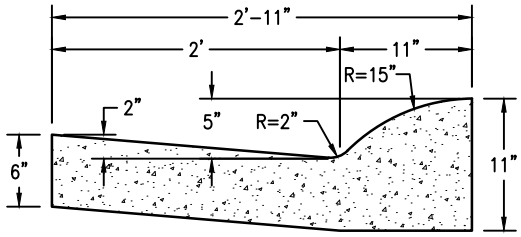
VERTICAL CURB & GUTTER



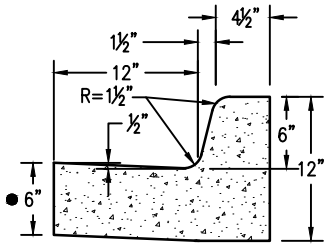
HIGH SPEED MOUNTABLE CURB & GUTTER
(DESIGN SPEED OF 45 M.P.H. OR HIGHER)



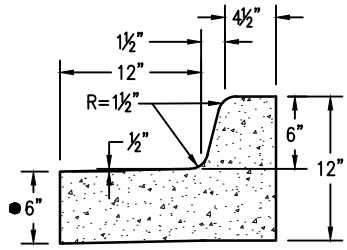
URBAN LOCAL MOUNTABLE CURB & GUTTER



RURAL LOCAL MOUNTABLE CURB & GUTTER



MEDIAN CURB & GUTTER (CATCH)



MEDIAN CURB & GUTTER (SPILL)

NOTES:

1. IF A SIDEWALK IS PLACED BEHIND THE CURB BUT IS NOT PLACED MONOLITHICALLY, EXPANSION JOINT MATERIAL AND A SILICONE BASE SEALER MUST BE APPLIED BETWEEN THE SIDEWALK AND THE CURB.
2. SEE DRAWING NUMBER SP.23a and SP.23b FOR TRENCH DRAIN.
3. SEE DRAWING NUMBER SP.31 AND SP.32 FOR CONCRETE JOINTS.

● GUTTER THICKNESS SHALL BE INCREASED TO MATCH CONCRETE PAVEMENT THICKNESS

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

DATE 10/1/2021

CURB & GUTTERS AND SIDEWALKS

DOUGLAS COUNTY
COLORADO

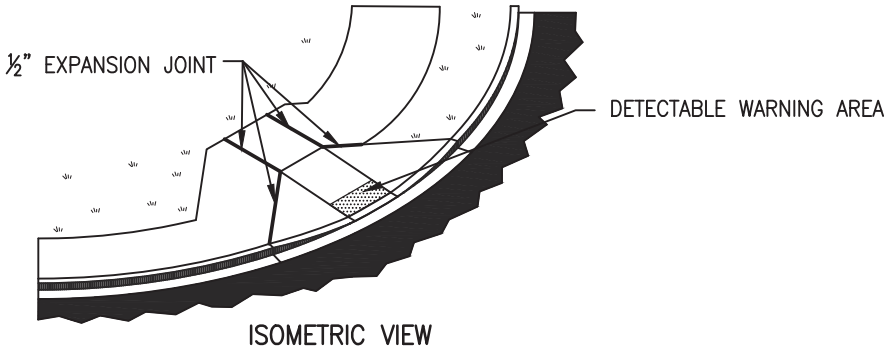
Issued: 05/2013

Revised: 10/2021

Drawing No.
SP.17

CURB RAMP GENERAL NOTES:

1. IN ACCORDANCE WITH CRS43-2-107(2), ADA COMPLIANT CURB RAMPS SHALL BE PROVIDED AT ALL PEDESTRIAN CROSSINGS AND AT PUBLIC TRANSPORTATION STOPS WHERE WALKWAYS INTERSECT A CURB. THESE LOCATIONS USUALLY INCLUDE, BUT ARE NOT LIMITED TO STREET CROSSINGS AT INTERSECTIONS AND AT DESIGNATED MID-BLOCK LOCATIONS.
2. THE FOLLOWING CURB RAMP TYPES ARE GENERAL REPRESENTATIONS. COLORADO DEPARTMENT OF TRANSPORTATION (CDOT). M STANDARD PLANS, LATEST EDITION PROVIDE ADDITIONAL ACCEPTABLE DETAILS. SEE DETAILED RAMP LAYOUTS ON THE PLANS FOR CONSTRUCTION.
3. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS OF DOUGLAS COUNTY.
4. SIDEWALKS SHALL BE RAMPED WHERE A DRIVEWAY IS EXTENDED ACROSS THE WALK.
5. DETAILS SHOWN IN THE PLAN SHALL APPLY TO ALL CONSTRUCTION OR RECONSTRUCTION OF STREETS, CURBS OR SIDEWALKS PER CURB RAMP DETAILS.
6. IN NEW CONSTRUCTION, RAMP AND CURB MAY BE POURED MONOLITHICALLY.
7. RAMP AND WINGS SHALL BE POURED MONOLITHICALLY.
8. MINIMUM WIDTH OF RAMPS SHALL BE 4 FEET AND RAMP SLOPES SHALL NOT BE STEEPER THAN 7.5%.
9. MAINTAIN BACK OF WALK ELEVATION AT 1.5% SLOPE FROM TOP OF CURB.
10. CONCRETE FOR SIDEWALK RAMPS SHALL BE CLASS "D".
11. A ½" EXPANSION JOINT SHALL BE REQUIRED WHERE THE CONCRETE RAMP JOINS ANY RIGID PAVEMENT OR STRUCTURE.
12. DRAINAGE STRUCTURES SHALL NOT BE PLACED IN LINE WITH RAMPS. LOCATION OF THE RAMP SHALL TAKE PRECEDENCE OVER LOCATION OF THE DRAINAGE STRUCTURE.



ISOMETRIC VIEW

DETECTABLE WARNING AREA NOTES

1. DETECTABLE WARNING AREAS SHALL BE INSTALLED WITHIN CURB RAMPS AT ALL SIDEWALK/STREET TRANSITIONS, AS DESCRIBED BY THE AMERICAN'S WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG), LATEST REVISION.
2. DETECTABLE WARNING DEVICES SHALL BE TRUNCATED DOME WARNING DEVICES. COLOR SHALL BE BRICK RED, TILE RED, OR OTHER EQUIVALENT COLOR TO PROVIDE COLOR CONTRAST WITH ADJACENT SURFACES, AS REQUIRED BY ADAAG SECTION 4.29.2. THE COUNTY ENGINEER MUST APPROVE THE TRUNCATED DOME WARNING AREA COLOR PRIOR TO CONSTRUCTION.
3. CONTRASTING COLOR REQUIREMENT SHALL BE MET BY TRUNCATED DOME SECTIONS AND NOT BY USE OF COLORED CONCRETE.
4. DETECTABLE WARNING SHALL BE ON CDOT'S APPROVED MATERIALS LIST. A SAMPLE OF THE DETECTABLE WARNING (TRUNCATED DOMES) TO BE USED ON THE PROJECT SHALL BE SUBMITTED TO AND ACCEPTED BY THE COUNTY ENGINEER PRIOR TO CONSTRUCTION.
5. ALL DETECTABLE WARNING AREAS SHALL START A MINIMUM OF 6 INCHES AND A MAXIMUM OF 5 FEET FROM THE FLOW LINE OF THE CURB UNLESS INSTALLED AT CUT-THROUGH REFUGE ISLANDS, IN WHICH CASE THE DWA WILL START AT THE EDGE OF THE ISLAND. ALL DETECTABLE WARNING AREAS SHALL BE 24 INCHES IN LENGTH AND COVER THE COMPLETE WIDTH OF THE RAMP AREA ONLY.
6. SURFACE APPLIED TRUNCATED DOME PANELS ARE ONLY ALLOWED ON PRE-EXISTING CURB RAMPS AND ARE NOT ALLOWED IN NEW CONSTRUCTION.

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

DATE 06/18/2021

CURB RAMP & DETECTABLE WARNING AREA NOTES

DOUGLAS COUNTY COLORADO

Issued: 05/2013

Revised: 05/2021

Drawing No.
SP.18a

Panel Installation Notes:

1. DETECTABLE WARNING PANELS, 24" X 24" OR 24" X 30" IN SIZE, SHALL BE PREFABRICATED REDDISH WITH TRUNCATED DOMES AND COMPLY WITH ADA REQUIREMENTS. ONLY FULL PANELS SHALL BE USED TO OBTAIN SPECIFIC RAMP THROAT WIDTH, (I.E. TWO 24" PANELS FOR A 4' RAMP, TWO 30" PANELS FOR A 5' RAMP, ETC.)

2. PRIOR TO START OF WORK, CONTRACTOR SHALL SUBMIT, TO DOUGLAS COUNTY FOR APPROVAL, A SAMPLE PANEL AND DOCUMENTATION FROM THE MANUFACTURER. PANEL SURFACE SHALL HAVE A MINIMUM OF 70% LIGHT REFLECTIVITY CONTRAST WITH THE ADJOINING SURFACE. PANELS SHALL ONLY BE SELECTED FROM THE APPROVED PRODUCT LIST BELOW:

PRODUCT NAME	MANUFACTURER	PRODUCER SUPPLIER CODE
CAST-DWD	Pioneer Detectable, LLC	GEN130004
Cast-In-Place Tactile	ADA Solutions, Inc.	GEN100123
DURALAST	EJ USA, Inc.	GEN130020
Detectable Warning Paving Slab	StoneBilt Concepts	GEN100341
TekWay Dome-Tiles	StrongGo LLC	GEN100343
TufTile Cast Iron Tile/Radius-Wedge (CIP)	TufTile, Inc.	GEN150088

3. PANELS SHALL BE PLACED AS SHOWN, WITH DOME PATTERN IN A SQUARE GRID AND ALIGNED IN THE DIRECTION OF TRAVEL. A STEEL TEMPLATE SHALL BE USED TO ENSURE PROPER ALIGNMENT AND UNIFORM GRADE.

4. REMOVE THE PROPER AMOUNT OF CONCRETE WITHIN THE TEMPLATE FOR AN ACCURATE INSTALLATION. ONCE TO THE PROPER DEPTH, FLOAT THE AREA TO RECEIVE THE PANELS UNTIL A SMOOTH PASTE HAS DEVELOPED.

5. WET THE BACK SIDE OF EACH PANEL AND TROWEL SOME CONCRETE PASTE OR APPROVED BONDING AGENT OVER THE WET SURFACE FOR BETTER ADHERENCE.

6. SET THE FIRST PANEL ON THE FRESHLY PREPARED SURFACE. DO NOT PRESS DOWN HARD ON THE PANEL, BUT PREFERABLY TWIST FROM SIDE TO SIDE. SET PANEL WITH RUBBER MALLET TO PROPER DEPTH SO THAT THE BASE OF THE TRUNCATED DOME IS AT THE SAME ELEVATION AS THE ADJOINING RAMP SURFACE.

7. SET SUCCESSIVE PANELS WITH A TIGHT BUTT JOINT AGAINST THE PREVIOUSLY SET PANEL. PROVIDE A ⅛" GAP BETWEEN PANELS.

8. FLOAT FRESH CONCRETE AROUND PANELS. FINISH AND BROOM SURROUNDING CONCRETE AS SPECIFIED. CLEAN ANY CONCRETE OFF PANELS WITH A SPONGE.

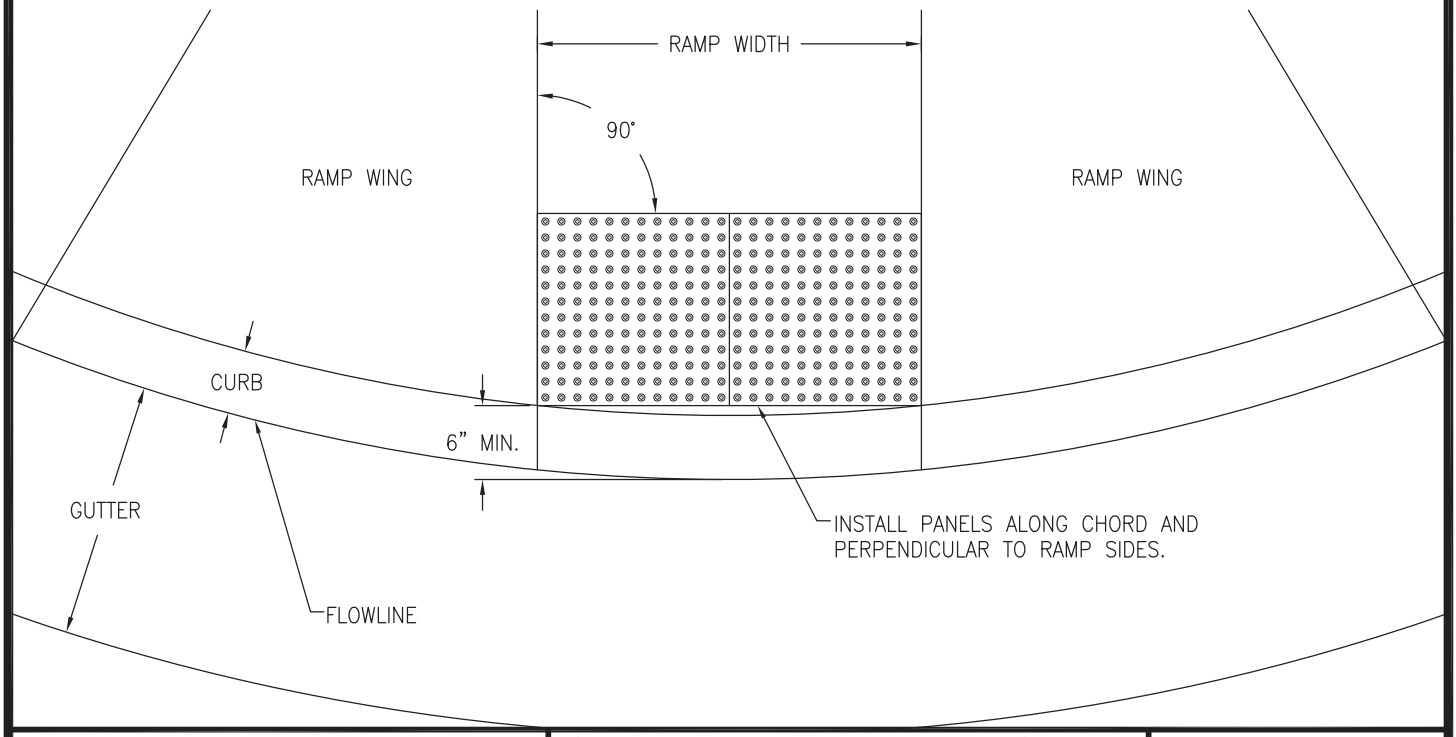
9. PROVIDE 1" DEEP TOOL JOINTS AT CORNERS OF DETECTABLE WARNING AREA, AND TOOL AROUND PANELS WITH ⅛" RADIUS EDGER.

10. WHEN CUT PANELS ARE REQUIRED, CUT SECTIONS SHALL NOT SIGNIFICANTLY IMPACT OVERALL TRUNCATED DOMES PATTERN AND CUT DOMES SHALL BE BEVELED AT A 45-DEGREE ANGLE TO CREATE A SMOOTH TRANSITION.

11. ANY PANELS THAT ARE DAMAGED DURING TRANSPORT OR INSTALLATION WILL BE REJECTED AND SHALL NOT BE INSTALLED.

12. CLEAN OUT ⅛" JOINT(S) BETWEEN PANELS AND SEAL WITH EPOXY.

13. SETTING TRUNCATED DOME PANELS IN SAND BEDDING OR OTHER NON-CEMENTITIOUS BEDDING MATERIALS SHALL NOT BE ALLOWED.



CURB RAMP WITH PANEL DETECTABLE WARNING AREA INSTALLATION

DOUGLAS COUNTY
COLORADO

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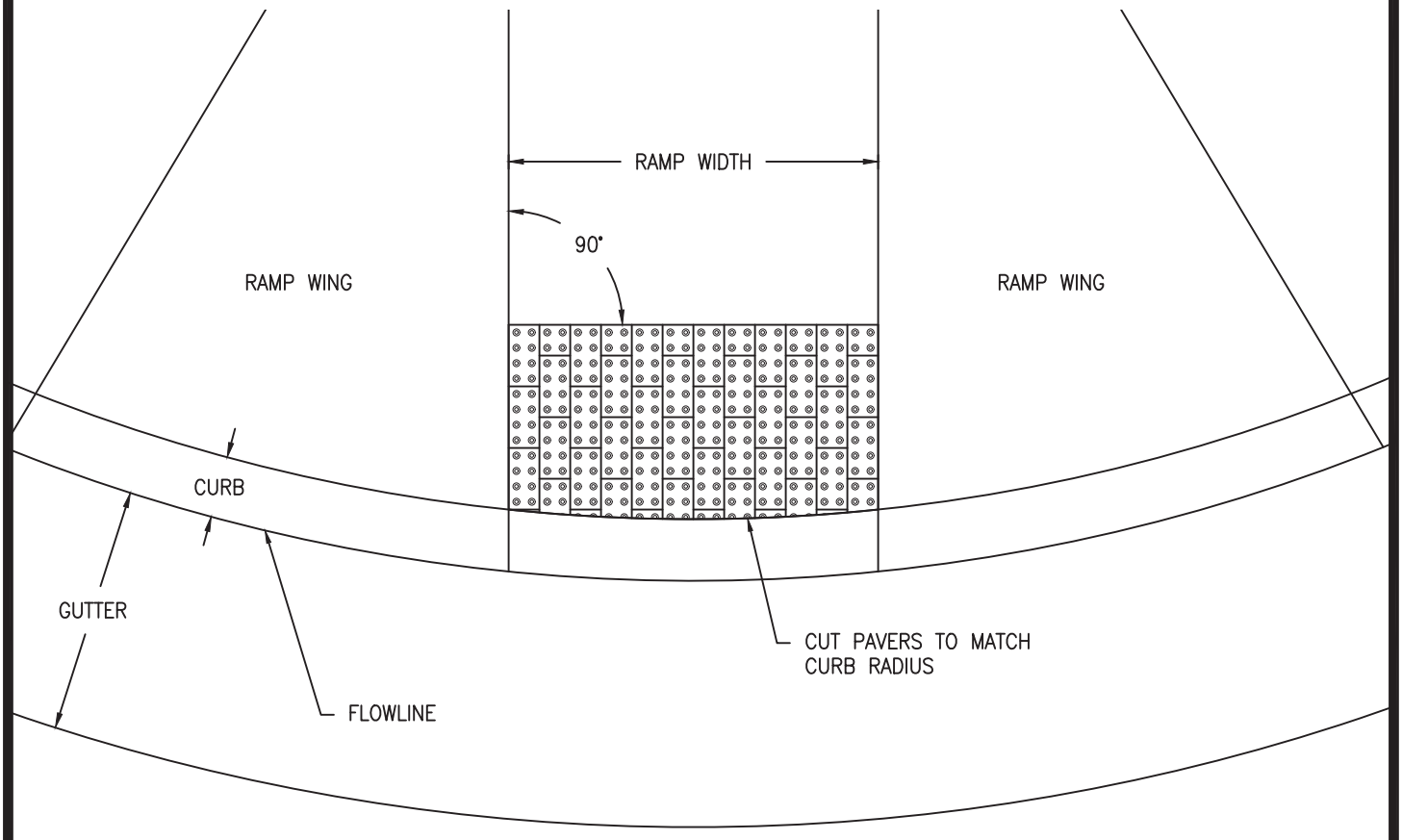
Revised: 09/2017

Drawing No.
SP.18b

Paver Installation Notes:

1. DETECTABLE WARNING PAVERS SHALL BE PREFABRICATED REDDISH INTEGRALLY COLORED TRUNCATED DOMES SURFACED CONCRETE OR MASONRY PAVERS. PAVERS SHALL MEET THE REQUIREMENTS OF ASTM C 902 OR ASTM C 936 AND COMPLY WITH ADA REQUIREMENTS.
2. PRIOR TO START OF WORK, CONTRACTOR SHALL SUBMIT, TO DOUGLAS COUNTY FOR APPROVAL, A SAMPLE PAVER AND DOCUMENTATION FROM THE MANUFACTURER. PAVERS SURFACE SHALL HAVE A MINIMUM OF 70% LIGHT REFLECTIVITY CONTRAST WITH THE ADJOINING SURFACE.
3. WELL FOR PAVERS SHALL BE ACCURATELY BLOCKED OUT TO ENSURE PROPER DEPTH, ALIGNMENT, AND UNIFORM GRADE. ONLY FULL WIDTH PAVERS SHALL BE USED TO OBTAIN SPECIFIED RAMP THROAT WIDTH.
4. PAVERS SHALL BE PLACED IN THE RUNNING PATTERN SHOWN, DOMES PLACED IN A SQUARE GRID AND ALIGNED IN THE DIRECTION OF TRAVEL. PAVERS SHALL BE INSTALLED SO THAT THE BASES OF THE TRUNCATED DOMES ARE AT THE SAME ELEVATION AS THE ADJOINING RAMP SURFACE.
5. SAND FOR BEDDING MATERIAL SHALL CONFORM TO ASTM C 33. SAND TO BE PLACED BETWEEN JOINTS SHALL CONFORM TO ASTM C 144.
6. BEDDING SAND SHALL BE SCREED TO THE APPROPRIATE DEPTH PRIOR TO THE PAVERS INSTALLATION. A PLATE VIBRATOR SHALL BE USED TO EMBED THE PAVERS INTO THE SAND. ANY PAVERS THAT ARE DAMAGED DURING TRANSPORTATION OR INSTALLATION WILL BE REJECTED AND SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.
7. WHEN CUT PAVERS ARE REQUIRED, CUT SECTIONS SHALL NOT SIGNIFICANTLY IMPACT OVERALL TRUNCATED DOMES PATTERN AND CUT DOMES SHALL BE BEVELED AT A 45–DEGREE ANGLE TO CREATE A SMOOTH TRANSITION.
8. JOINT SPACING SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS, BUT SHALL NOT BE MORE THAN ⅛". JOINTS SHALL BE FILLED COMPLETELY WITH SAND. EXCESS SAND SHALL BE REMOVED BY SWEEPING.
9. DETECTABLE WARNING PAVERS SHALL ONLY BE USED WITH PRIOR APPROVAL BY THE COUNTY.



APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

DATE 06/18/2021

CURB RAMP WITH PAVER DETECTABLE WARNING AREA INSTALLATION

DOUGLAS COUNTY
COLORADO

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DIRECTOR OF PUBLIC WORKS ENGINEERING

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DOUGLAS COUNTY
COLORADO

CURB RAMP WITH PAVER DETECTABLE WARNING AREA INSTALLATION

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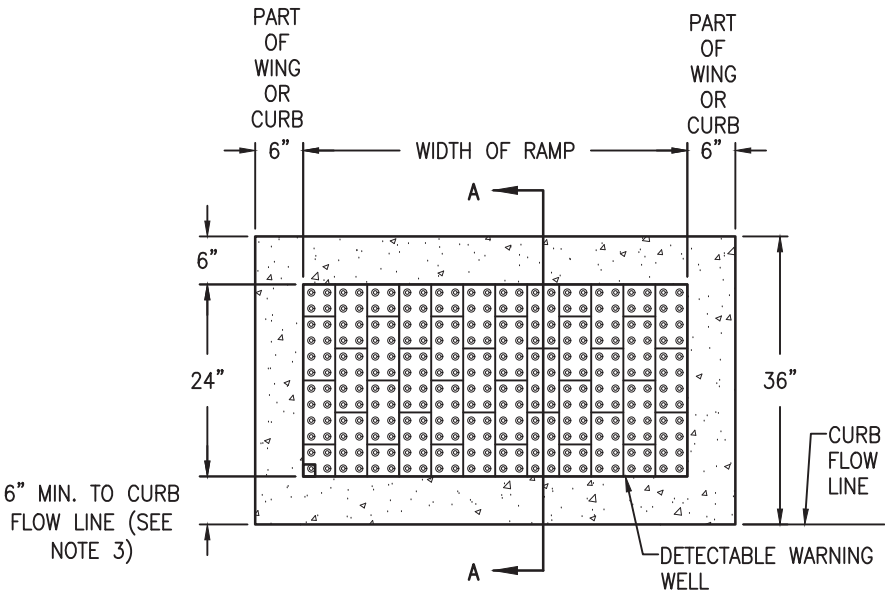
Drawing No. **SP.18d**

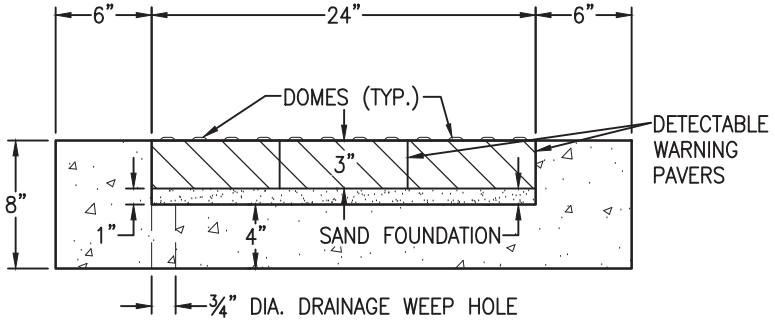


PLAN VIEW OF
DETECTABLE WARNING AND WELL

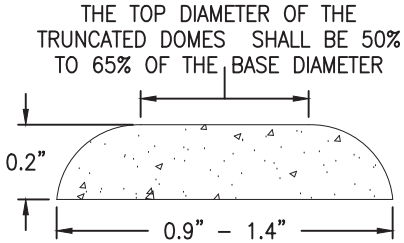
(PAVERS NOT DRAWN TO SCALE)

GENERAL NOTES

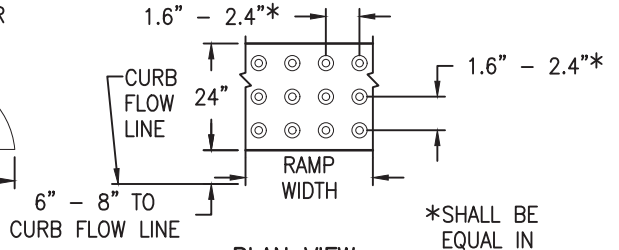
1. THE DETECTABLE WARNINGS SHALL BE INSTALLED AT SIDEWALK/STREET TRANSITIONS. THEY SHALL BE MADE IN PAVER FORM WITH A TRUNCATED DOME SURFACE. THE DOMES SHALL BE PLACED IN A SQUARE GRID.
2. THE TOP OF THE DRAINAGE WEEP HOLE SHALL BE LOCATED AT THE LOWEST POINT OF THE DETECTABLE WARNING WELL.
3. ALL DETECTABLE WARNING AREAS SHALL START A MINIMUM OF 6 INCHES FROM THE FLOW LINE OF THE CURB UNLESS INSTALLED AT CUT-THROUGH REFUGE ISLANDS, IN WHICH CASE THE DWA WILL START AT THE EDGES OF THE ISLAND. ALL DETECTABLE WARNING AREAS SHALL BE 24 INCHES IN LENGTH AND COVER THE COMPLETE WIDTH OF THE RAMP AREA ONLY.
4. RAMP SLOPES SHALL NOT BE STEEPER THAN 7.5%.
5. DETECTABLE WARNING PAVERS SHALL ONLY BE USED WITH PRIOR APPROVAL BY THE COUNTY.



SECTION A-A



ELEVATION VIEW



PLAN VIEW

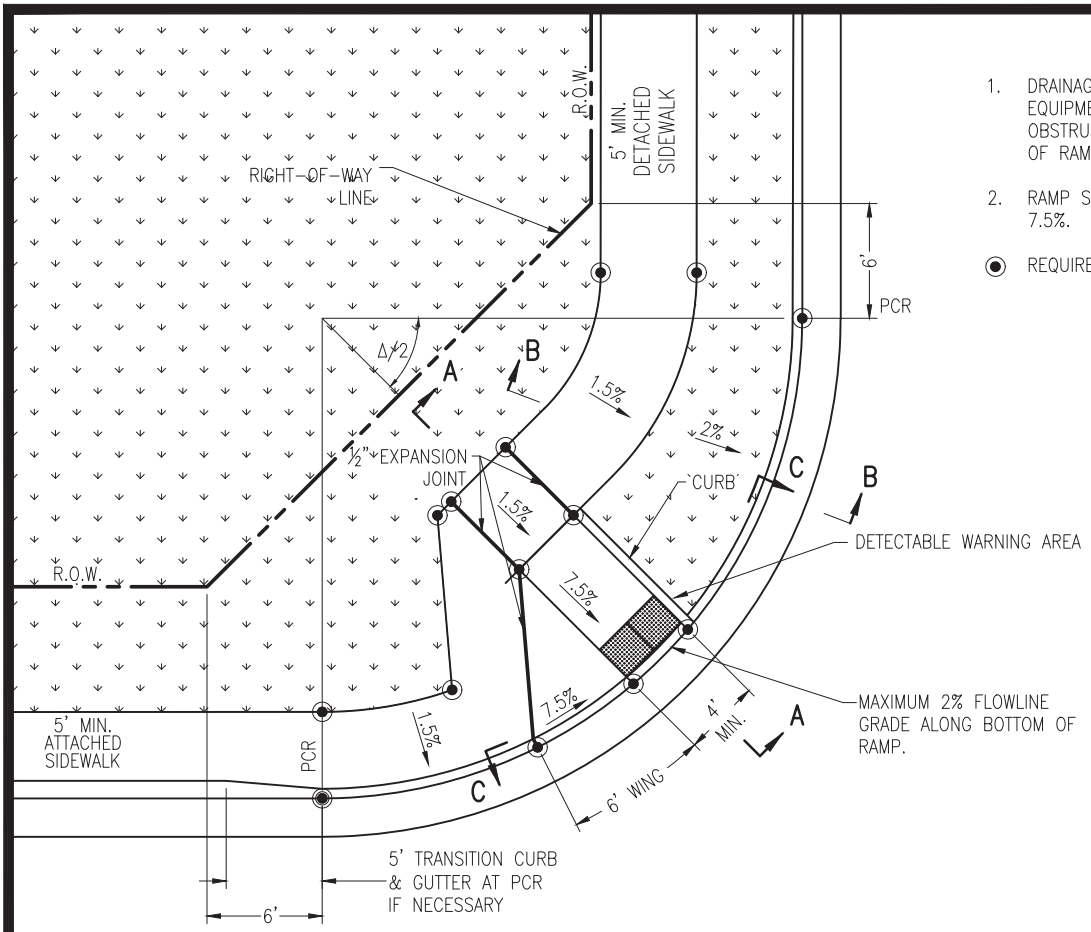
*SHALL BE EQUAL IN BOTH DIRECTIONS.

DETECTABLE WARNING AREA AND DOME DETAILS-PAVERS

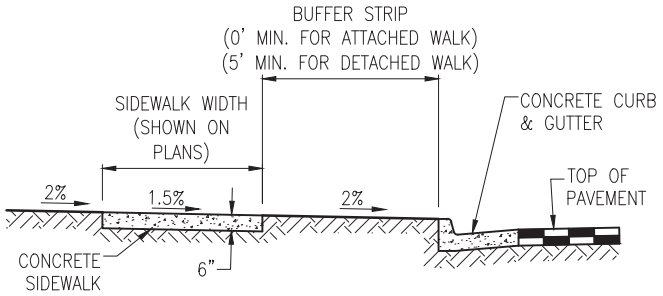
GENERAL NOTES

1. DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, JUNCTION BOXES, OR OTHER OBSTRUCTIONS ARE NOT ALLOWED IN FRONT OF RAMP ACCESS AREAS.
2. RAMP SLOPES SHALL NOT BE STEEPER THAN 7.5%.

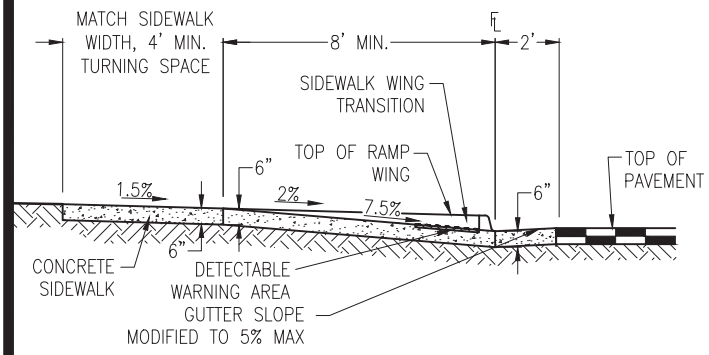
◉ REQUIRED SPOT ELEVATION



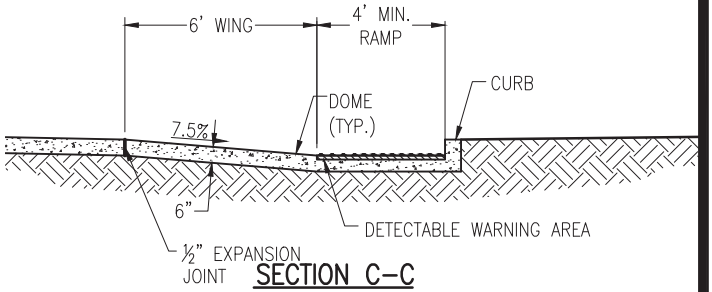
PLAN



SECTION B–B



SECTION A–A



SECTION C–C

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

DATE 07/2021

CURB RAMP FOR CURB RETURN RADIUS OF 20' TO 30'

DOUGLAS COUNTY COLORADO

Issued: 05/2013

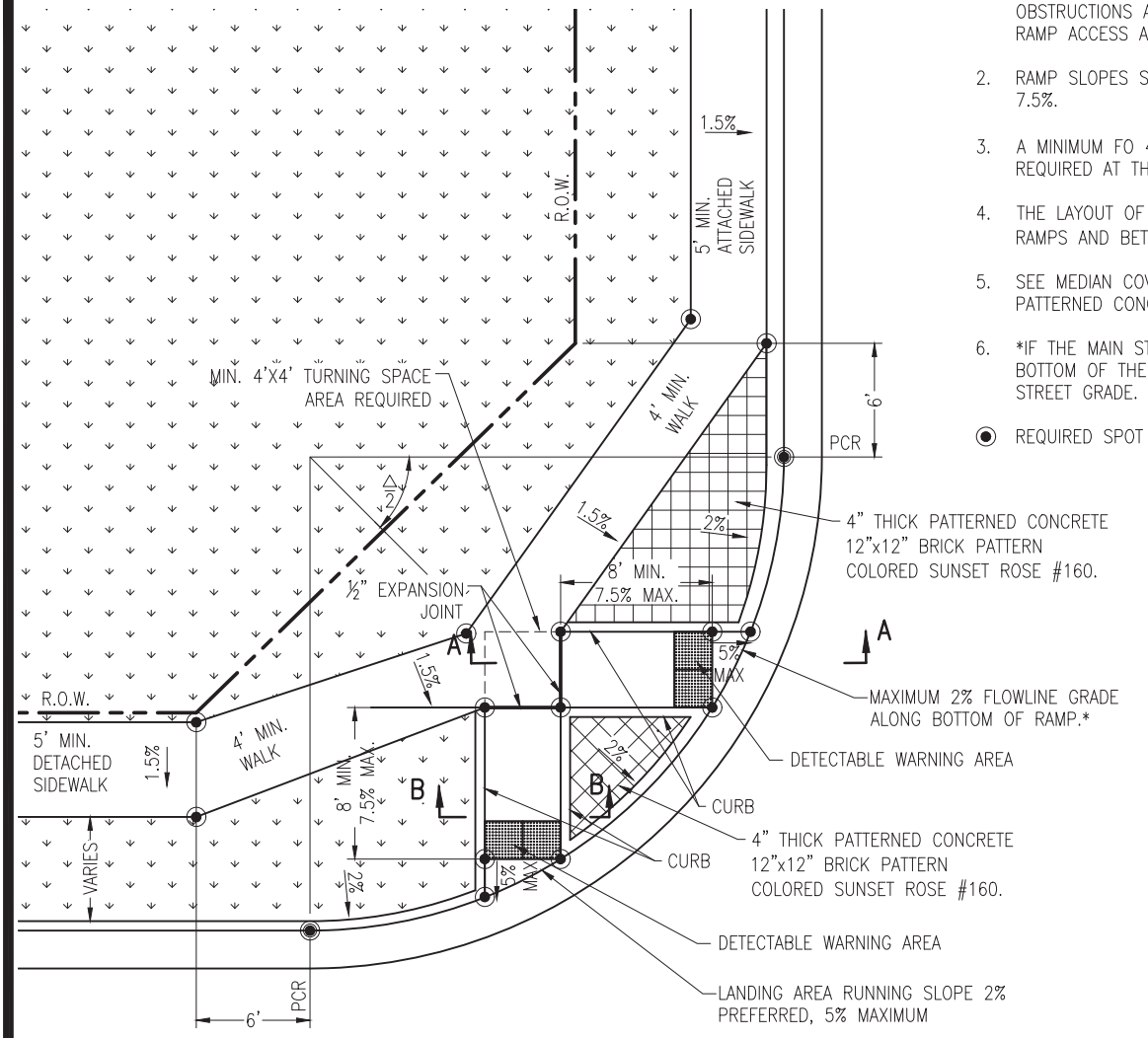
Revised: 07/2021

Drawing No. **SP.19a**

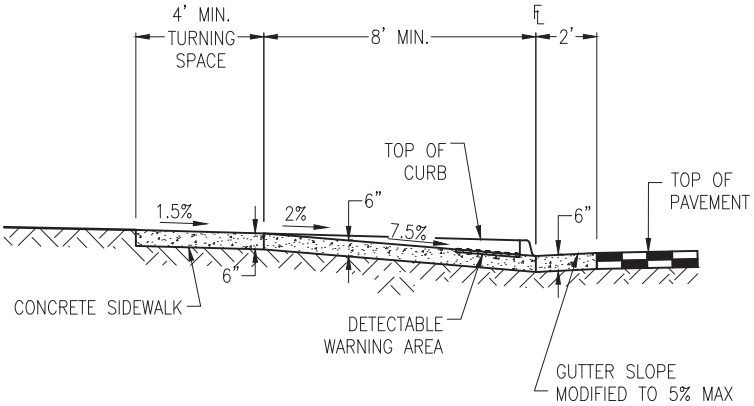
GENERAL NOTES

1. DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, JUNCTION BOXES, OR OTHER OBSTRUCTIONS ARE NOT ALLOWED IN FRONT OF RAMP ACCESS AREAS.
2. RAMP SLOPES SHALL NOT BE STEEPER THAN 7.5%.
3. A MINIMUM FO 4'X4' TURNING SPACE AREA IS REQUIRED AT THE TOP OF THE RAMPS.
4. THE LAYOUT OF THE SIDEWALK BEHIND THE RAMPS AND BETWEEN THE PCR'S VARIES.
5. SEE MEDIAN COVER MATERIAL DETAIL FOR PATTERNED CONCRETE SPECIFICATIONS.
6. *IF THE MAIN STREET IS UNCONTROLLED THE BOTTOM OF THE MAIN STREET RAMP CAN MATCH STREET GRADE.

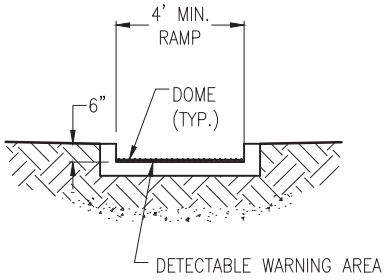
◉ REQUIRED SPOT ELEVATION



PLAN



SECTION A–A



SECTION B–B

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

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CURB RAMP FOR CURB RETURN RADIUS OF 35' TO 50'

DOUGLAS COUNTY COLORADO

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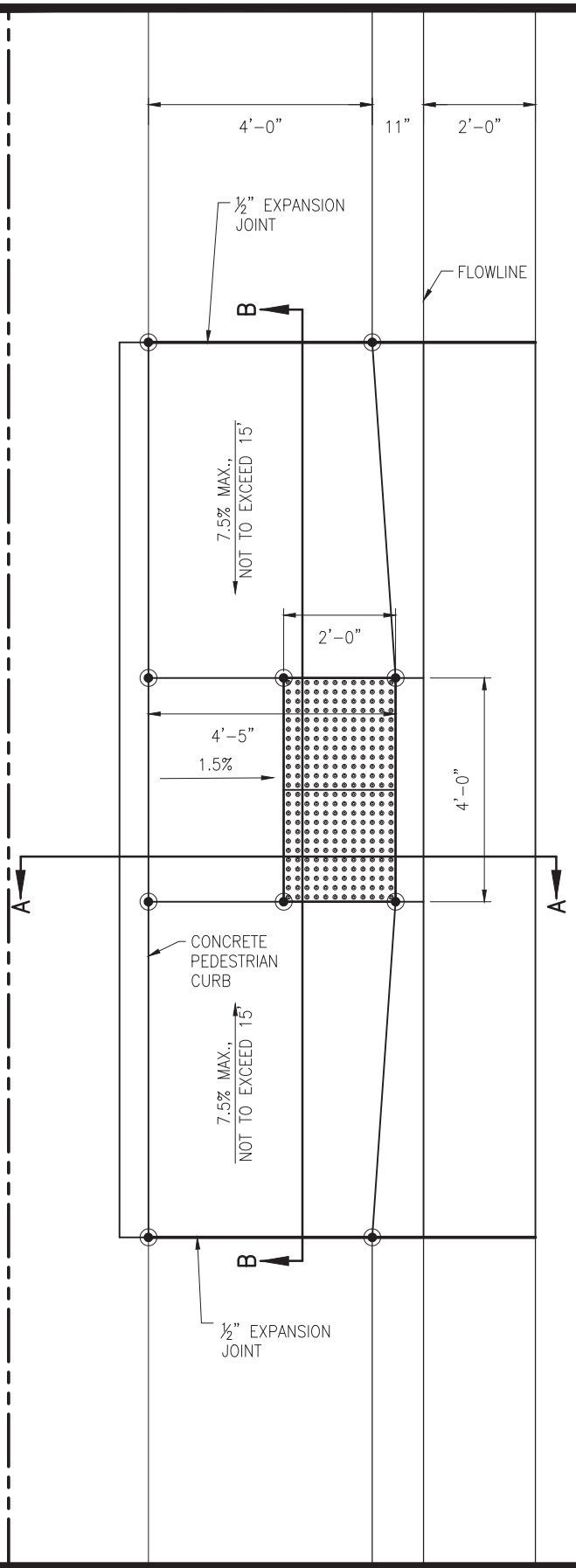
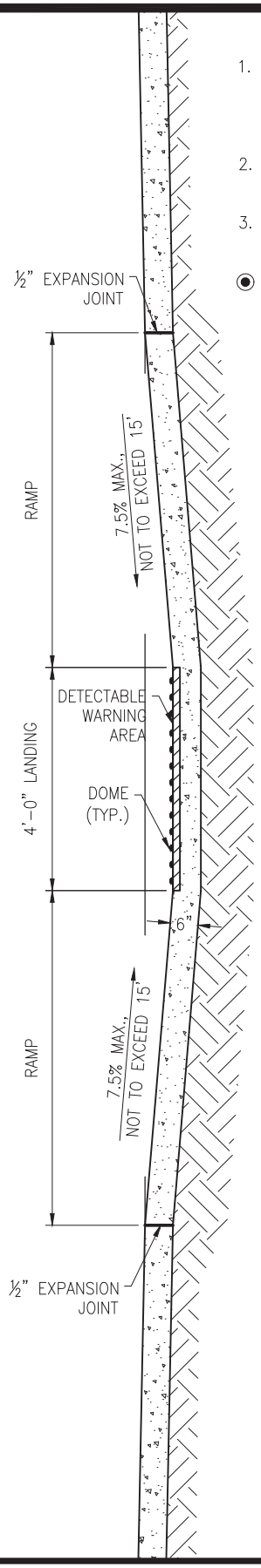
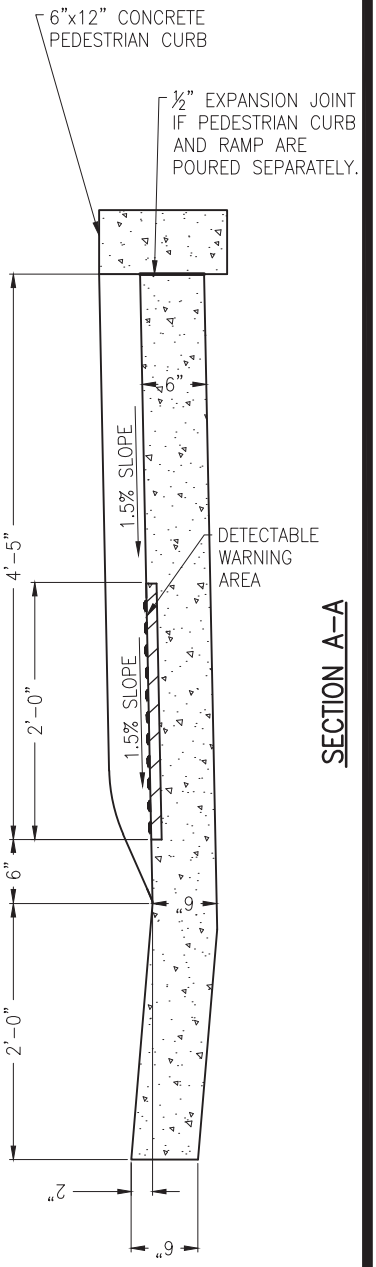
Revised: 07/2021

Drawing No. **SP.19b**





SECTION B-B



SECTION A-A

GENERAL NOTES

1. DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, JUNCTION BOXES, OR OTHER OBSTRUCTIONS ARE NOT ALLOWED IN FRONT OF RAMP ACCESS AREAS.
2. RAMP SLOPES SHALL NOT BE STEEPER THAN 7.5%.
3. *-THE BOTTOM OF RAMP CAN MATCH STREET GRADE.

◉ REQUIRED SPOT ELEVATION

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DIRECTOR OF PUBLIC WORKS ENGINEERING

DATE 06/18/2021

MID-BLOCK CURB RAMP

DOUGLAS COUNTY
COLORADO

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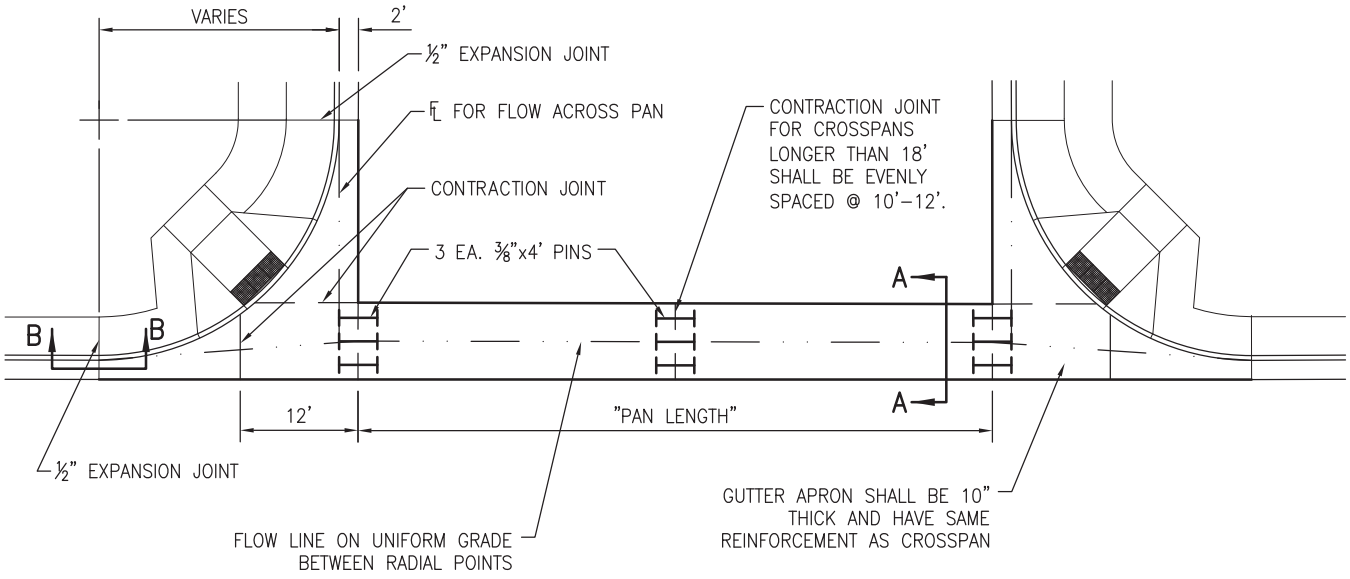
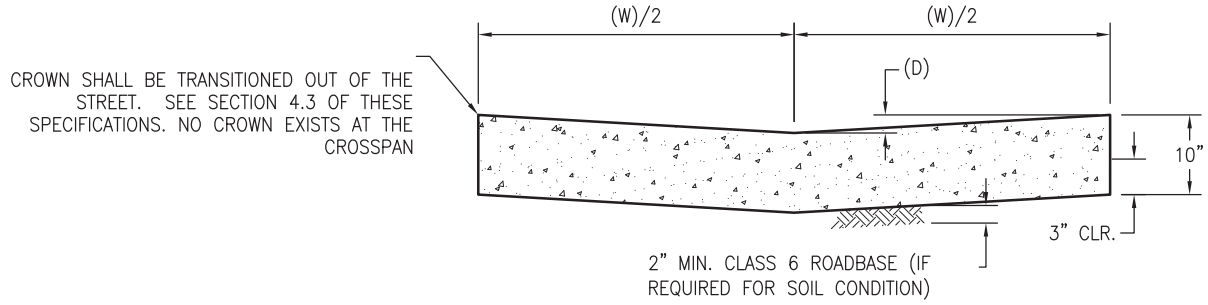
Drawing No.
SP.20

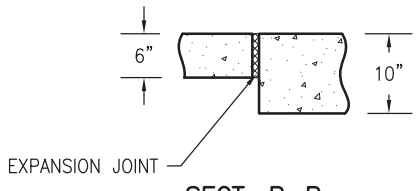


PLAN



SECTION A–A

FIBERMESH MIXED AT 1½ LBS. / C.Y. CONCRETE.



SECT. B–B

WIDTH (W)	DEPTH (D)	THICKNESS (T)
8'	2"	10"
10'	2½"	10"

NOTE: LOCAL STREET INTERSECTIONS REQUIRE AN 8' CROSSPAN. COLLECTOR STREET INTERSECTIONS REQUIRE AN 10' CROSSPAN. CROSSPANS ARE NOT ALLOWED AT ANY ARTERIAL STREET INTERSECTIONS.

CROSSPAN

DOUGLAS COUNTY COLORADO

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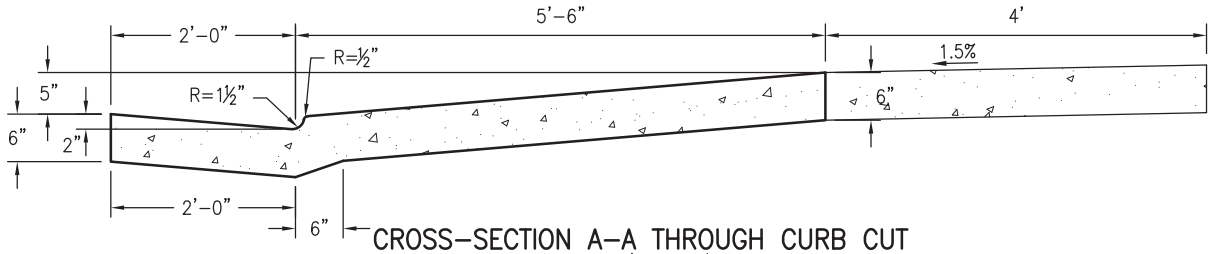
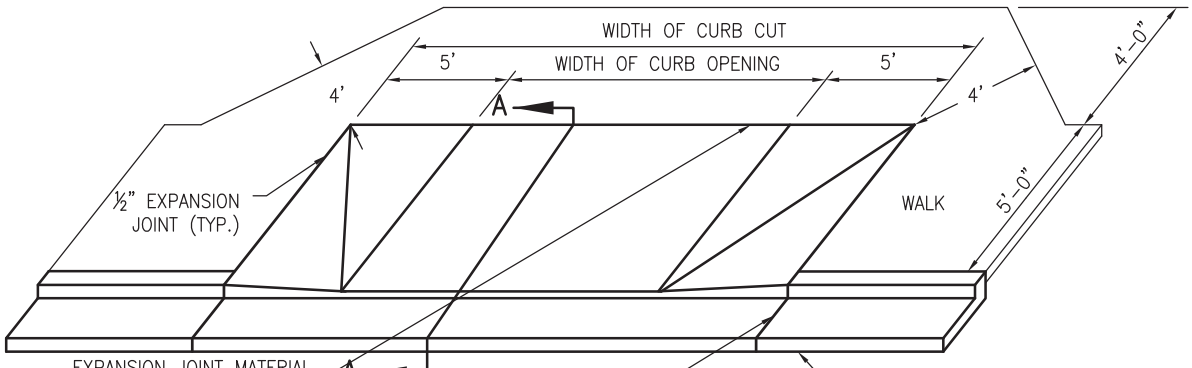
Drawing No. **SP.21**

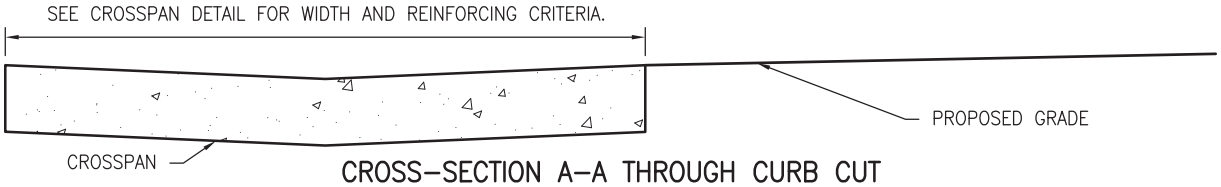


CROSS-SECTION A-A THROUGH CURB CUT

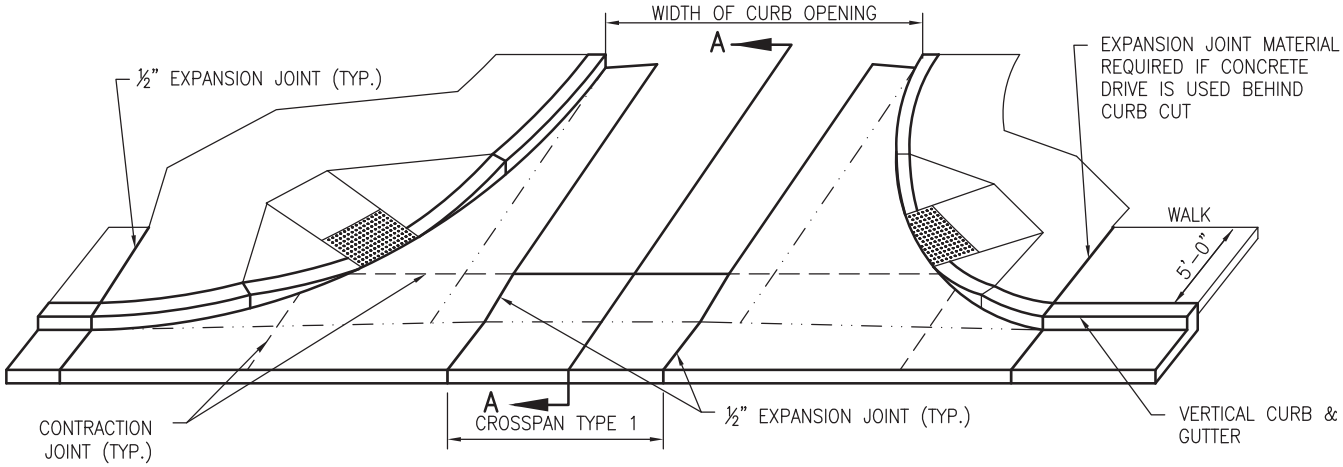
FIBERMESH MIXED AT 1½ LBS. / C.Y. CONCRETE.



CURB OPENING WITH TAPERS



CROSS-SECTION A-A THROUGH CURB CUT



CURB OPENING WITH CROSSPAN

NOTES:

1. BACK OF CURB CUT EXTENDS TO BACK OF WALK OR BACK OF BICYCLE PATH. IF NO WALK IS PRESENT, EXTEND BACK OF CURB CUT TO 5'-6" BEHIND FLOWLINE OR TO R.O.W. LINE, WHICHEVER IS GREATER.
2. COUNTY SHALL APPROVE LOCATION OF CURB CUT BEFORE CONSTRUCTION.
3. CURB OPENINGS OF 30' OR MORE MUST BE CONSTRUCTED WITH A MINIMUM 20' RADIUS CURB RETURN.
4. DESIGN ENGINEER MUST DEMONSTRATE THAT STREET DRAINGE STAYS WITHIN THE STREET RIGHT-OF-WAY.

CURB OPENING

DOUGLAS COUNTY
COLORADO

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JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

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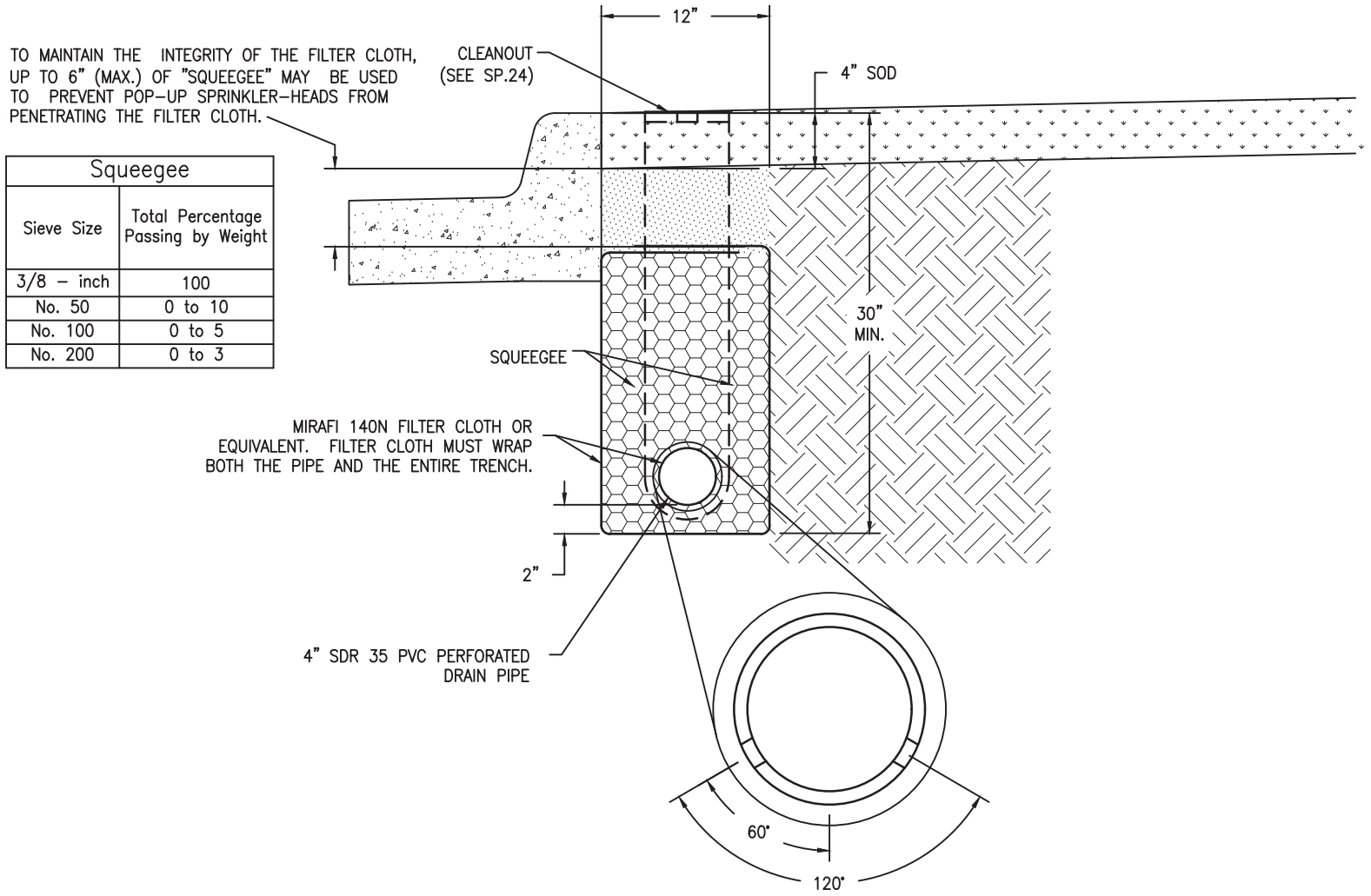
DOUGLAS COUNTY
COLORADO

TRENCH DRAIN



Squeegee	
Sieve Size	Total Percentage Passing by Weight
3/8 – inch	100
No. 50	0 to 10
No. 100	0 to 5
No. 200	0 to 3

NOTES:

1. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.
2. THE 4" DRAIN PIPE SHALL BE CONNECTED TO A STORM DRAINAGE INLET OR MANHOLE. IF AN INLET OR MANHOLE IS NOT ACCESSIBLE, THE OUTLET MUST BE CONSTRUCTED PER SECTION 4.6.4 OF THE ROADWAY STANDARDS.
3. IF TRENCH DRAIN IS TO BE PLACED UNDER PAVEMENT, THE TRENCH DRAIN NEEDS TO BE SCHEDULE 80 SOLID WALL PIPE WITH CLEANOUTS INSTALLED ON BOTH SIDES OF THE PAVEMENT.

4" SDR 35 PVC PERFORATED DRAIN PIPE SPECS:

½"-⅝" OPENINGS (2" LONG SLOTS ACCEPTABLE)

5" O.C. HOLE SPACING.

JOINT TYPE: RUBBER GASKET OR GLUE ALLOWED. (PER MANUFACTURERS RECOMMENDATIONS)

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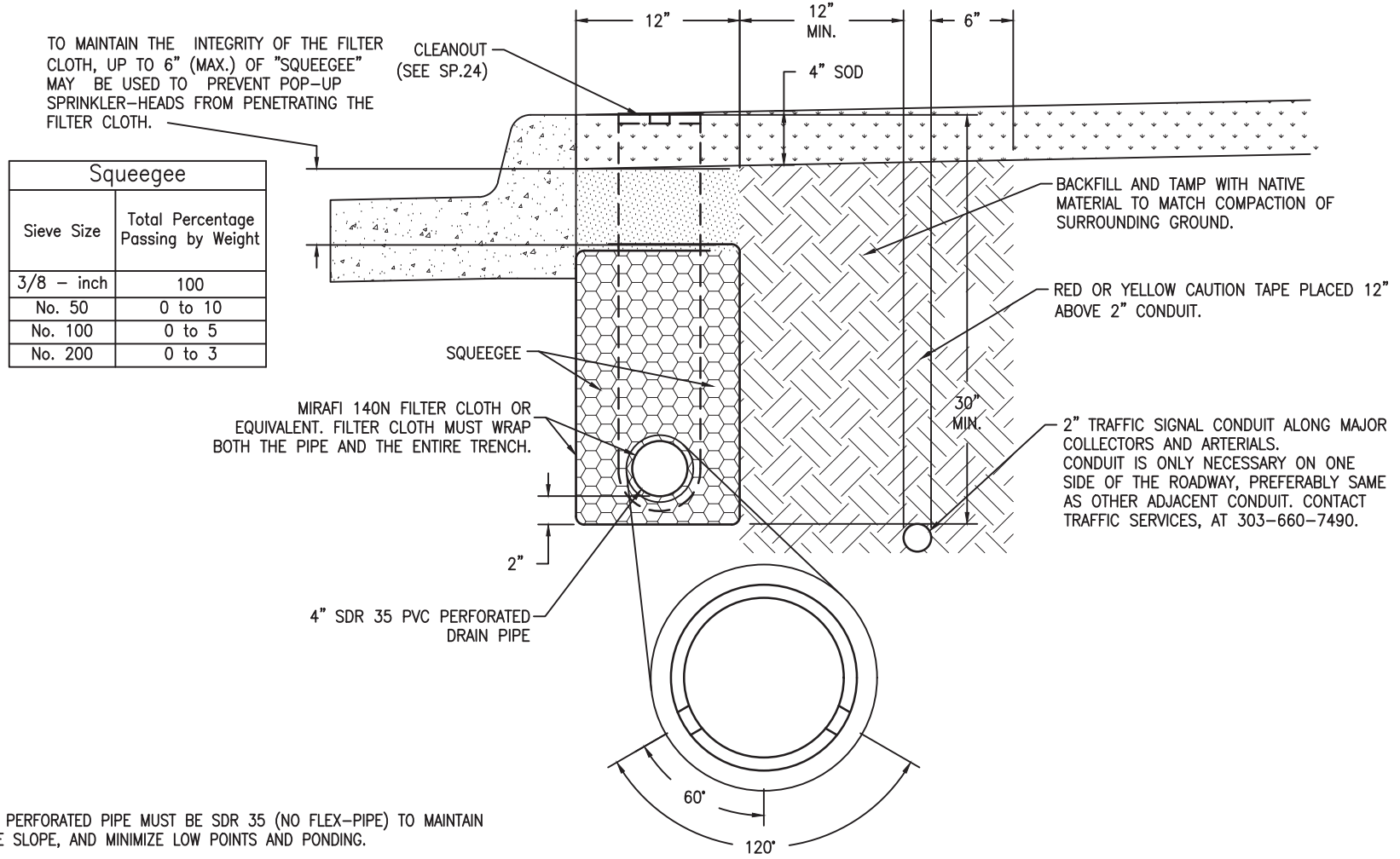
DATE 06/18/2021

DOUGLAS COUNTY
COLORADO

TRENCH DRAIN WITH TRAFFIC SIGNAL CONDUIT



Squeegee	
Sieve Size	Total Percentage Passing by Weight
3/8 – inch	100
No. 50	0 to 10
No. 100	0 to 5
No. 200	0 to 3

NOTES:

1. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.
2. THE 4" DRAIN PIPE SHALL BE CONNECTED TO A STORM DRAINAGE INLET OR MANHOLE. IF AN INLET OR MANHOLE IS NOT ACCESSIBLE, THE OUTLET MUST BE CONSTRUCTED PER SECTION 4.6.4 OF THE ROADWAY STANDARDS.
3. IF SIDEWALK IS ATTACHED TO THE CURB, THEN THE TRENCH DRAIN SHALL BE LOCATED BEHIND THE SIDEWALK.
4. TRAFFIC SIGNAL CONDUIT SHALL BE 2" SCHEDULE 80 PVC WITH PULL ROPE AND TRACE WIRE. TYPE I PULLBOX SHALL BE INSTALLED AT 500 FEET MAXIMUM SPACING AND AT BOTH CORNERS OF INTERSECTIONS.
5. TRAFFIC SIGNAL CONDUIT AND PULL BOXES SHALL BE IN CONFORMANCE WITH THE DOUGLAS COUNTY TRAFFIC SIGNAL SPECIFICATIONS – APPENDIX F.
6. IF TRENCH DRAIN IS TO BE PLACED UNDER PAVEMENT, THE TRENCH DRAIN NEEDS TO BE SCHEDULE 80 SOLID WALL PIPE WITH CLEANOUTS INSTALLED ON BOTH SIDES OF THE PAVEMENT

4" SDR 35 PVC PERFORATED DRAIN PIPE SPECS:

½"–⅝" OPENINGS (2" LONG SLOTS ACCEPTABLE)

5" O.C. HOLE SPACING.

JOINT TYPE: RUBBER GASKET OR GLUE ALLOWED. (PER MANUFACTURERS RECOMMENDATIONS)

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DATE 05/2021

DOUGLAS COUNTY
COLORADO

TRENCH DRAIN WITH SIDEWALK

Issued: 05/2013
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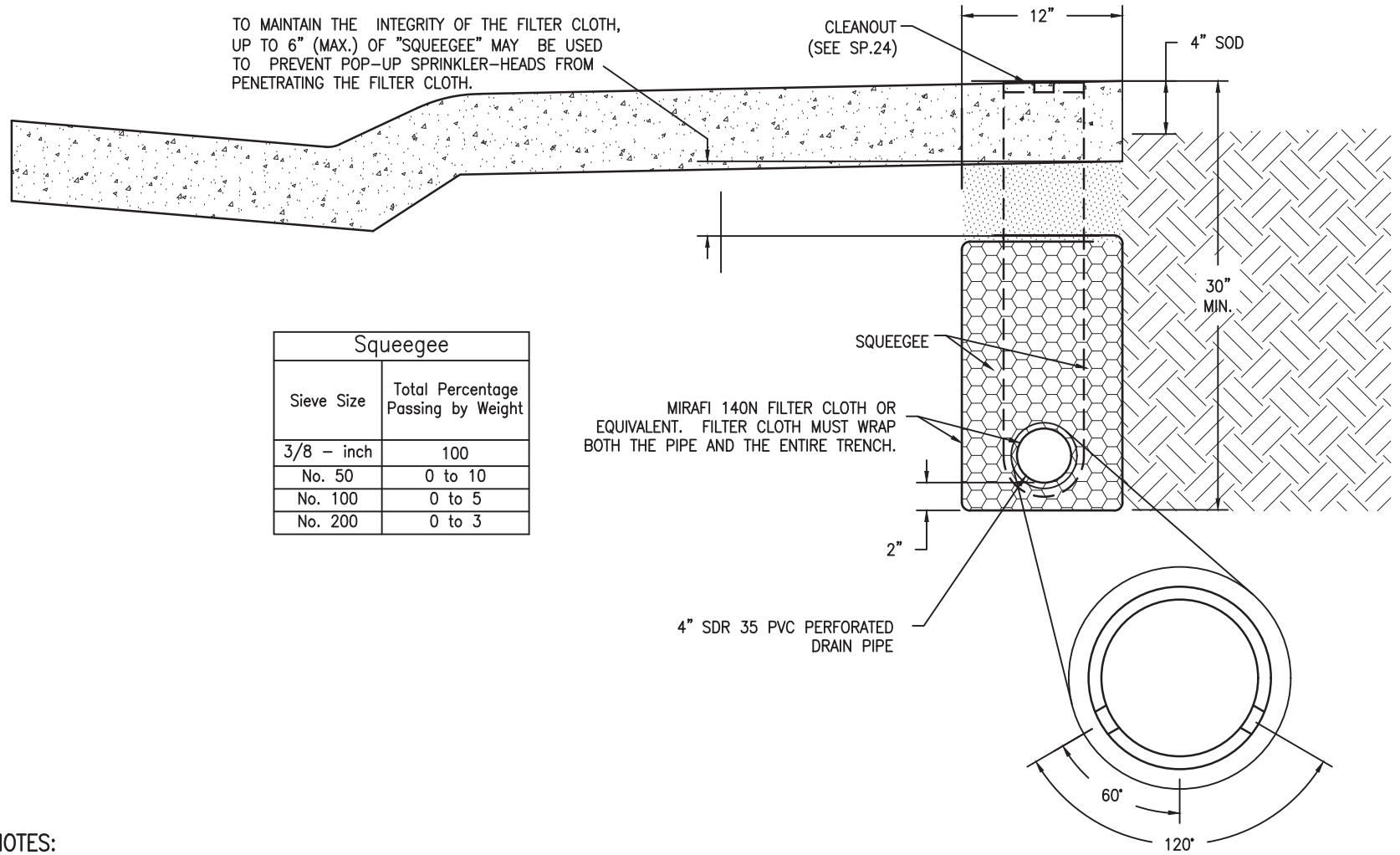
Drawing No.
SP.23c



Squeegee	
Sieve Size	Total Percentage Passing by Weight
3/8 – inch	100
No. 50	0 to 10
No. 100	0 to 5
No. 200	0 to 3

NOTES:

1. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.
2. THE 4" DRAIN PIPE SHALL BE CONNECTED TO A STORM DRAINAGE INLET OR MANHOLE. IF AN INLET OR MANHOLE IS NOT ACCESSIBLE, THE OUTLET MUST BE CONSTRUCTED PER SECTION 4.6.4 OF THE ROADWAY STANDARDS.
3. IF TRENCH DRAIN IS TO BE PLACED UNDER PAVEMENT, THE TRENCH DRAIN NEEDS TO BE SCHEDULE 80 SOLID WALL PIPE WITH CLEANOUTS INSTALLED ON BOTH SIDES OF THE PAVEMENT.

4" SDR 35 PVC PERFORATED DRAIN PIPE SPECS:

½"-⅝" OPENINGS (2" LONG SLOTS ACCEPTABLE)

5" O.C. HOLE SPACING.

JOINT TYPE: RUBBER GASKET OR GLUE ALLOWED. (PER MANUFACTURERS RECOMMENDATIONS)

APPROVED BY DOUGLAS COUNTY

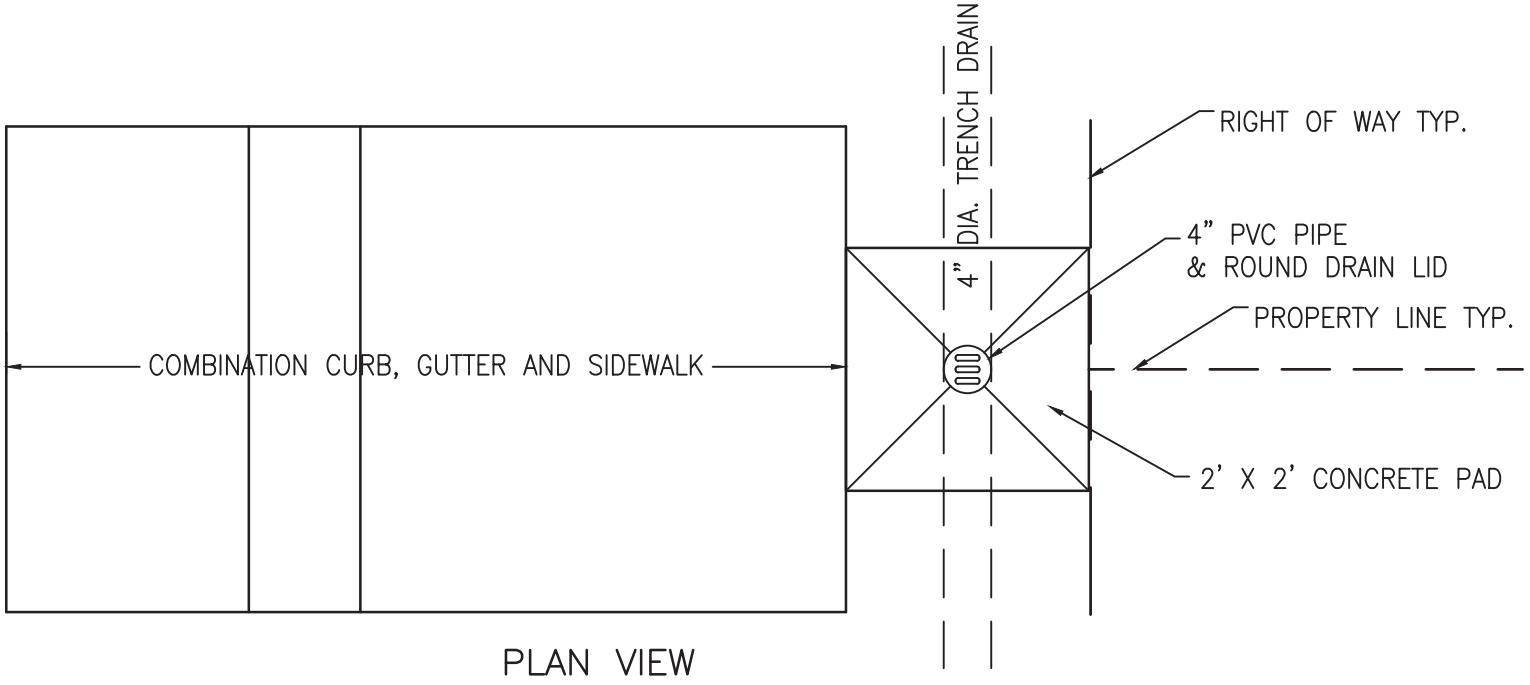
Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

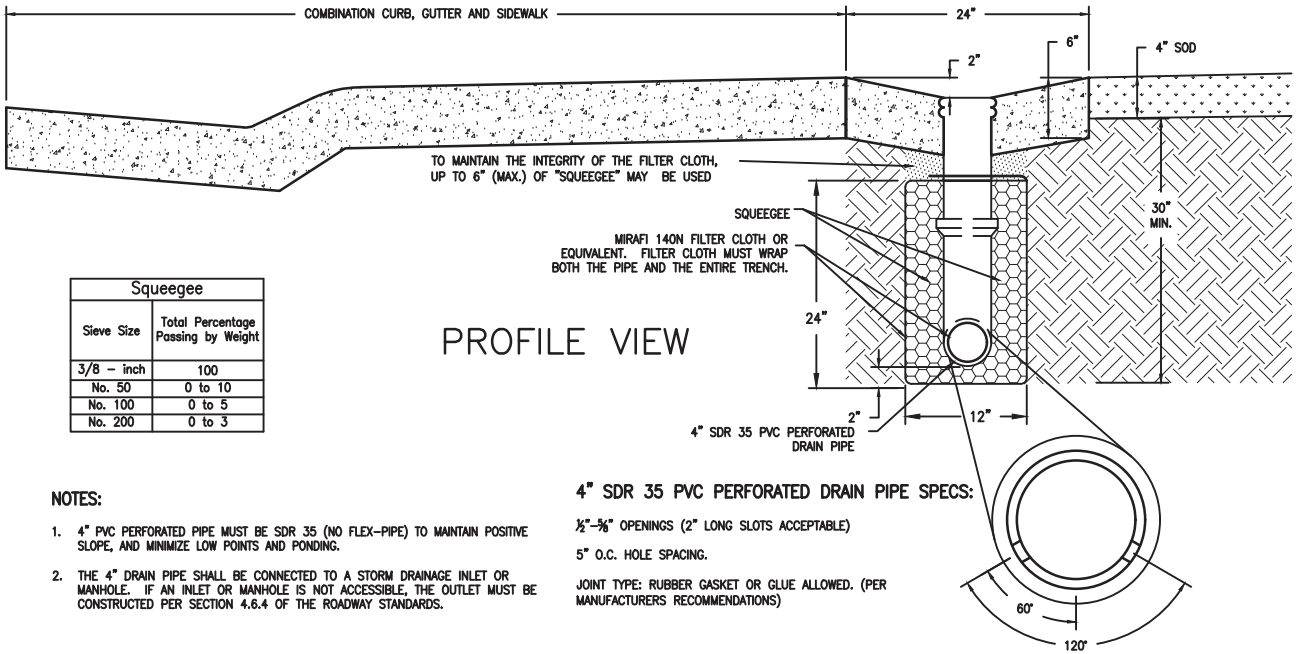
DATE 06/18/2021

DOUGLAS COUNTY
COLORADO

TRENCH DRAIN INLET WITH SIDEWALK



PLAN VIEW



PROFILE VIEW

Squeegee	
Sieve Size	Total Percentage Passing by Weight
3/8 – inch	100
No. 50	0 to 10
No. 100	0 to 5
No. 200	0 to 3

NOTES:

1. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX–PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.
2. THE 4" DRAIN PIPE SHALL BE CONNECTED TO A STORM DRAINAGE INLET OR MANHOLE. IF AN INLET OR MANHOLE IS NOT ACCESSIBLE, THE OUTLET MUST BE CONSTRUCTED PER SECTION 4.6.4 OF THE ROADWAY STANDARDS.

4" SDR 35 PVC PERFORATED DRAIN PIPE SPECS:

½"–⅝" OPENINGS (2" LONG SLOTS ACCEPTABLE)

5" O.C. HOLE SPACING.

JOINT TYPE: RUBBER GASKET OR GLUE ALLOWED. (PER MANUFACTURERS RECOMMENDATIONS)

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DOUGLAS COUNTY
COLORADO

TRENCH DRAIN CLEANOUT

Issued: 05/2013
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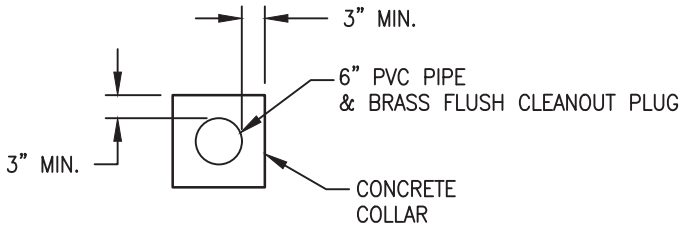
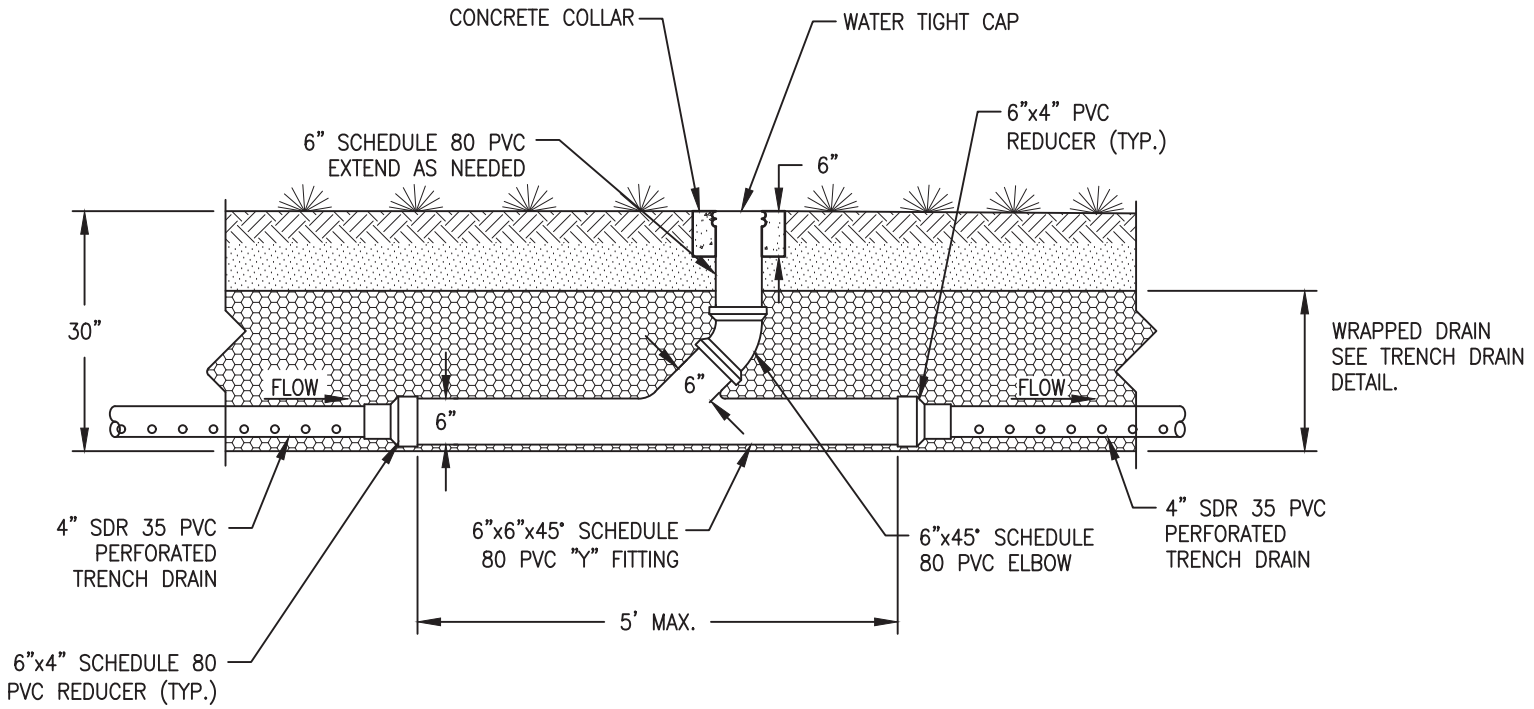
Drawing No.
SP.24

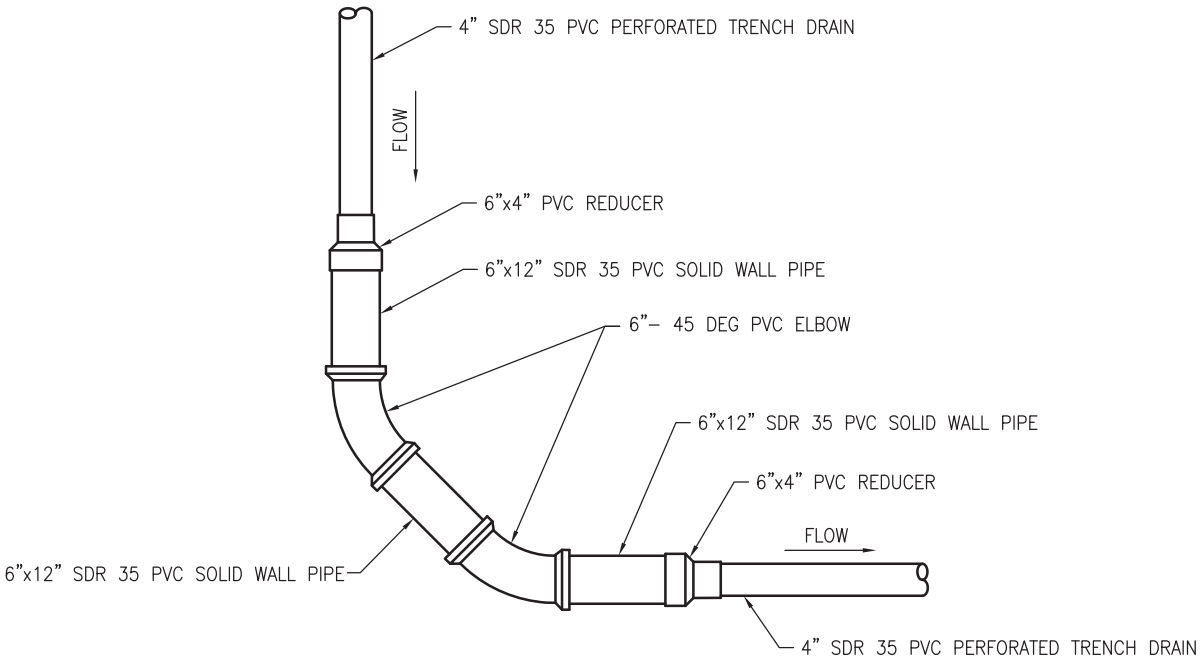
NOTES:

1. OUTSIDE DIAMETER OF CONCRETE COLLAR SHALL BE LARGE ENOUGH TO ACHIEVE 3" THICK MIN. CONCRETE OUTSIDE OF PIPE FITTING. COLLAR SHALL ALLOW PVC CAP TO BE REMOVED AND REPLACED AS INTENDED.
2. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.
3. MAX. SPACING 200'



PLAN VIEW OF COLLAR





TRENCH DRAIN 90° CORNER

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised: 09/2017

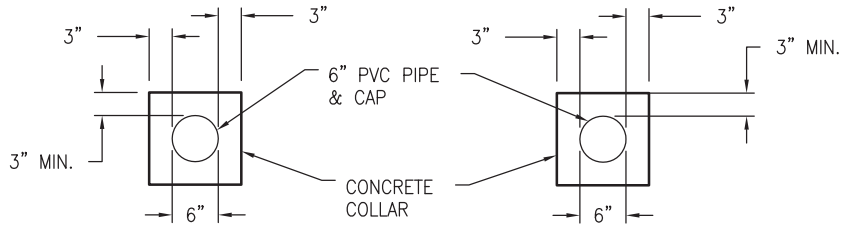
Drawing No.
SP.25

BACK TO BACK TRENCH DRAIN CLEANOUTS

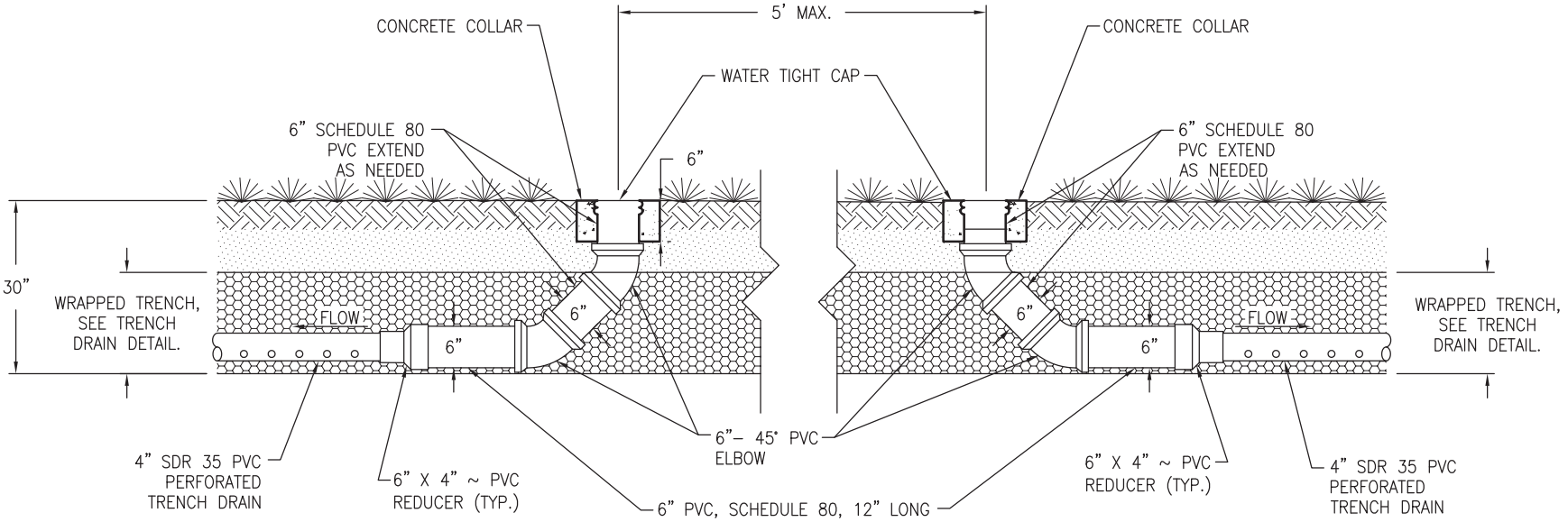
DOUGLAS COUNTY
COLORADO

NOTES

1. OUTSIDE DIAMETER OF CONCRETE COLLAR SHALL BE LARGE ENOUGH TO ACHIEVE 3" THICK CONCRETE MIN. OUTSIDE OF PIPE FITTING. COLLAR SHALL ALLOW PVC CAP TO BE REMOVED AND REPLACED AS INTENDED.
2. 4" PVC PERFORATED PIPE MUST BE SDR 35 (NO FLEX-PIPE) TO MAINTAIN POSITIVE SLOPE, AND MINIMIZE LOW POINTS AND PONDING.

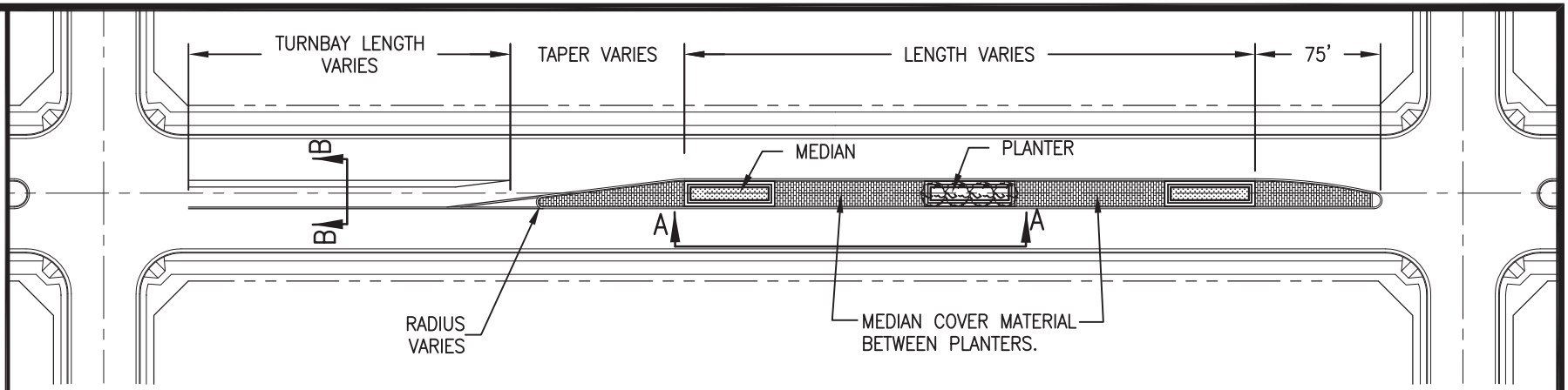


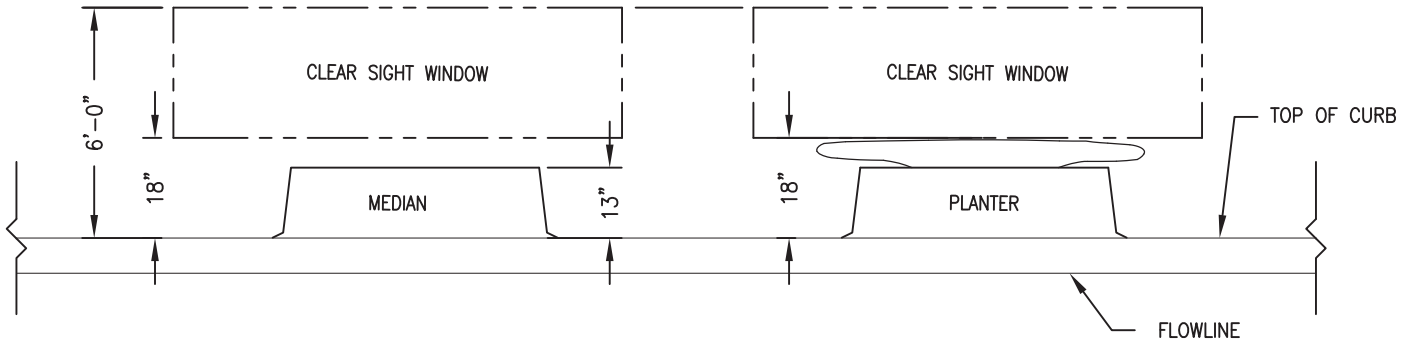
PLAN VIEW



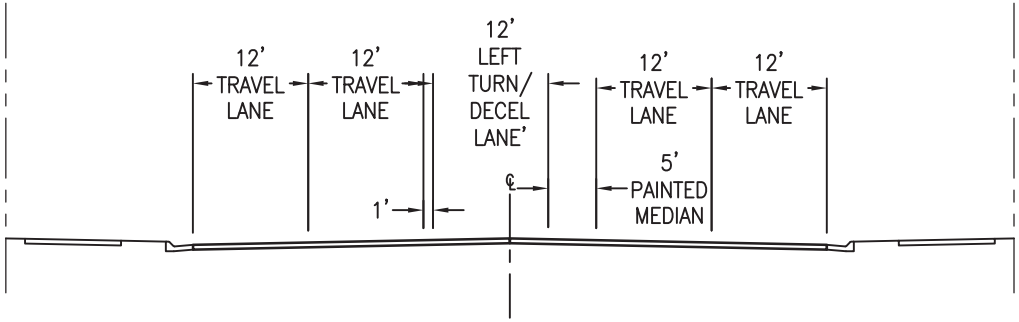
Issued: 05/2013
Revised: 09/2017

Drawing No.
SP.26





SECTION A–A



SECTION B–B

NOTES:

1. RESTRICTED PLANTING – LOW SHRUBS AND GROUND COVER THAT DO NOT EXCEED 1'–6" ABOVE TOP OF ADJACENT CURB.

2. PLANTERS SHALL BE SPACED TO PROVIDE SAFE SIGHT DISTANCE.

3. MATURE VEGETATION GROWTH SHALL NOT EXTEND OVER BACK OF CURB INTO ADJACENT LANES.

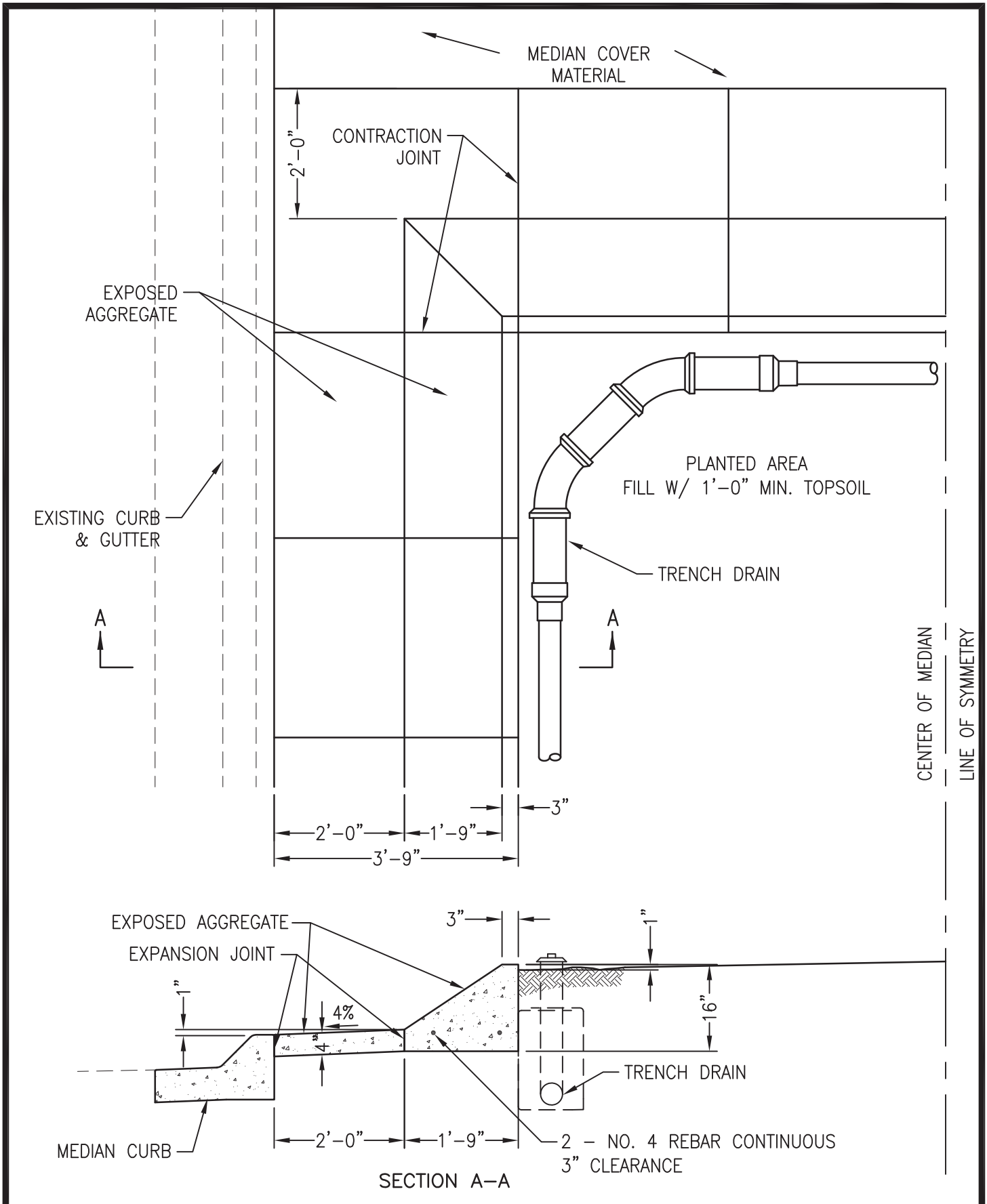
DOUGLAS COUNTY COLORADO

MEDIAN PLANTER LAYOUT

Issued: 05/2013

Revised:

Drawing No. **SP.27**



SECTION A–A

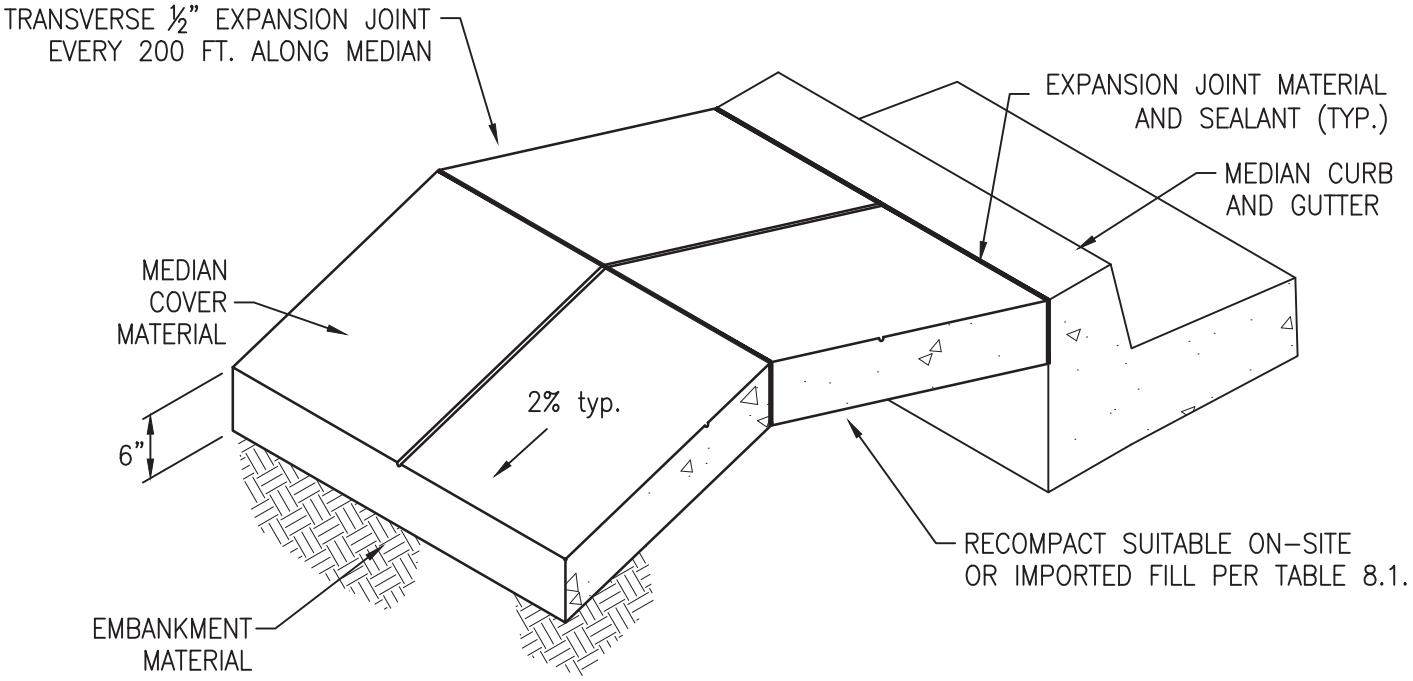
MEDIAN PLANTER DETAILS

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

Drawing No.
SP.28



NOTES:

1. MEDIAN COVER MATERIAL SHALL BE CLASS D OR CLASS P CONCRETE.
2. INSTALL ½"x6" EXPANSION MATERIAL AT MEDIAN NOSES, FIXED OBJECTS, AND AT TRANSVERSE JOINTS AT 200 FT. INTERVALS (MAXIMUM) ALONG THE MEDIAN.
3. CONCRETE IS TO BE COLORED SUNSET ROSE #160 OR APPROVED EQUAL WHEN MEDIAN IS IN A CONCRETE ROADWAY.
4. FOR WEED CONTROL PRIOR TO MEDIAN PAVING, APPLY A PRE-EMERGENT HERBICIDE TO MEDIAN SUBGRADE AREA PER MANUFACTURER'S SPECIFICATIONS FOR PAVING UNDER THE BARRIER 50 LABEL (PBI GORDAN). TRIFLURALIN IS LABELED FOR USE UNDER ASPHALT UNDER THE TREFLAN 4EC LABEL (EIANCO).

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

DATE 06/18/2021

MEDIAN COVER MATERIAL

DOUGLAS COUNTY COLORADO

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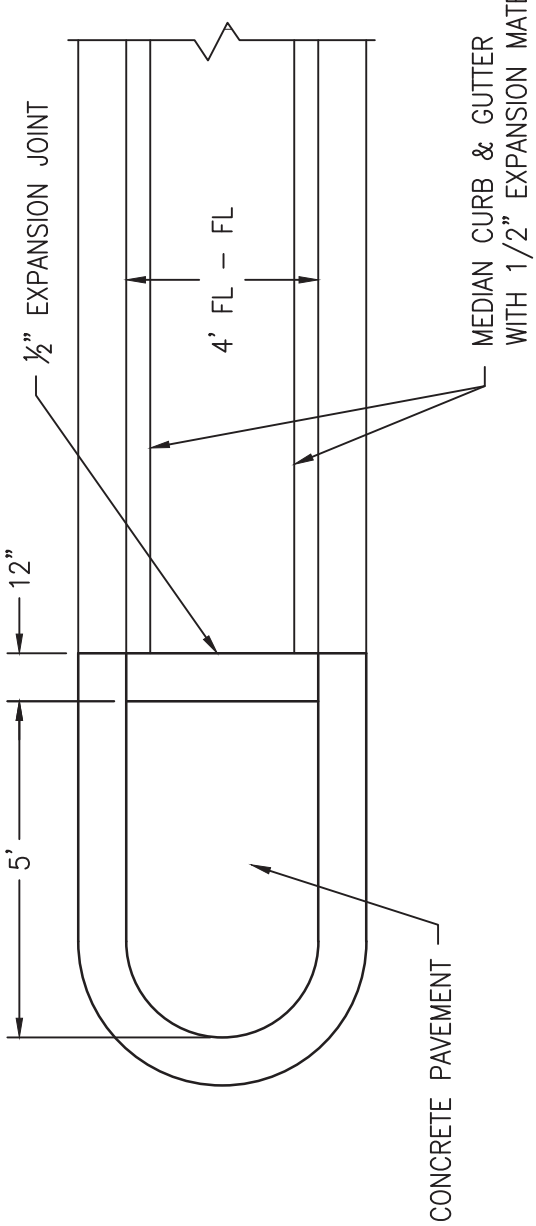
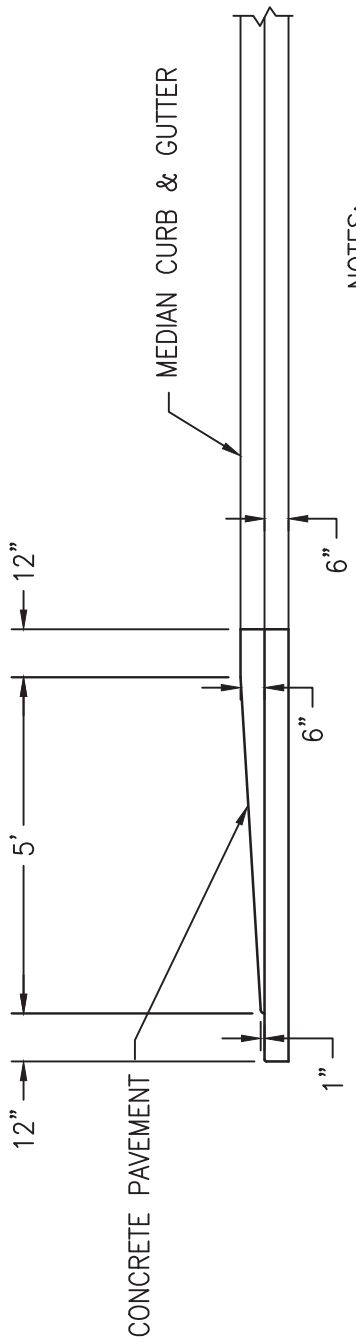
Drawing No.
SP.29





NOTES:

1. SEE SS-7 FOR MEDIAN NOSE SIGN AND DELINEATION

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

DATE 06/18/2021

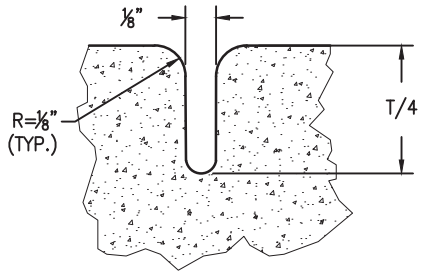
MEDIAN NOSE DETAIL

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

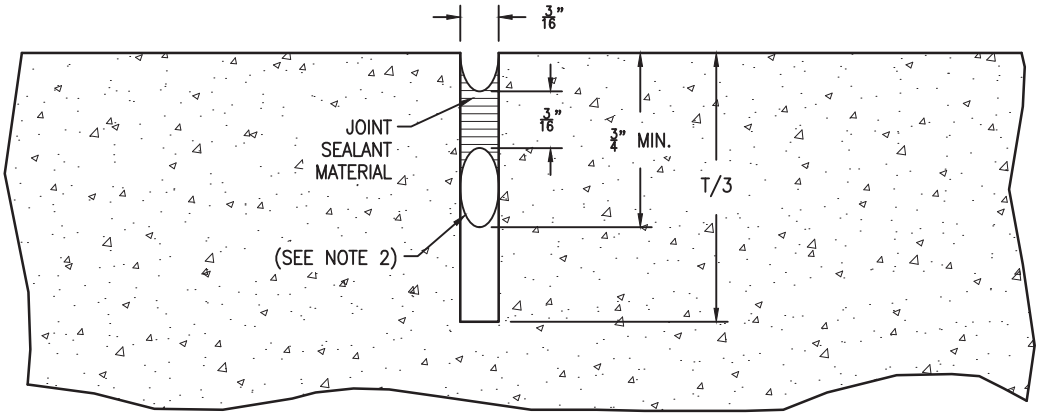
Revised: 05/2021

Drawing No.
SP.30



CONTRACTION OR WEAKEN PLANE JOINT

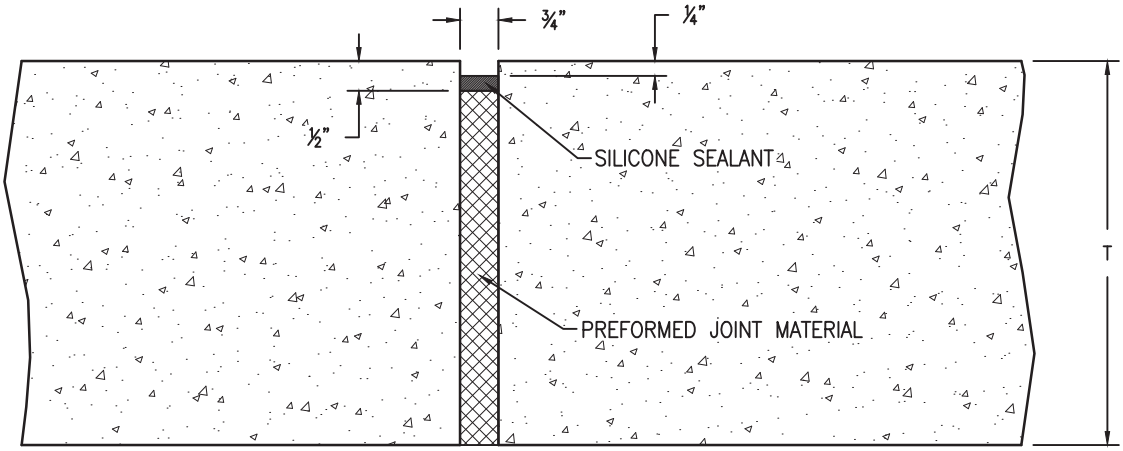
N.T.S.



NOTE: WASH & BLOW OUT WITH FORCED AIR UNTIL DRY BEFORE APPLYING SEALANT MATERIAL.

SAWED JOINT

N.T.S.



EXPANSION JOINT

N.T.S.

NOTES:

1. JOINT SEALANT MATERIAL MUST BE ON CDOT APPROVED PRODUCTS LIST.
2. ⅜" DIA. BACKER ROD.

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

DATE 06/18/2021

CONCRETE JOINTS

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised: 07/2020

Drawing No.
SP.31

REFERENCE:

CDOT M & S STANDARDS

M-412-1

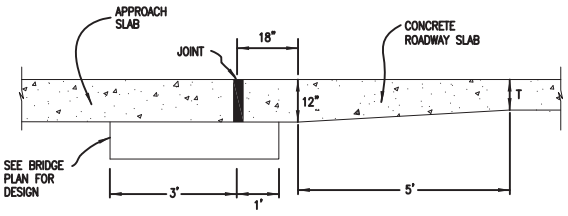
DOUGLAS COUNTY
COLORADO

CONCRETE JOINTS

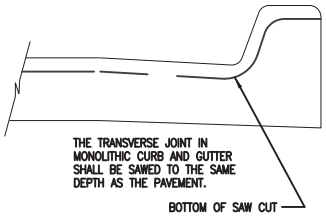
Issued: 05/2013

Revised:

Drawing No.
SP.32



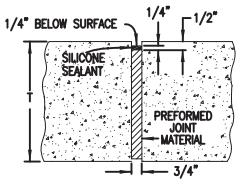
BRIDGE APPROACH



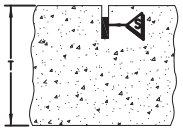
GENERAL NOTES

1. PAVEMENT THICKNESS (T), SHALL BE AS CALLED FOR IN THE PLANS.

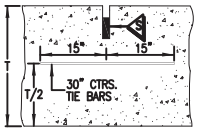
PAVEMENT THICKNESS (T)	TIE BAR SIZE	DOWELL BAR DIAMETER
T < 8 IN.	No. 4	1 IN.
8 IN. ≥ T ≤ 10 IN.	No. 5	1.25 IN.
10 IN. > T ≤ 15 IN.	No. 6	1.50 IN.



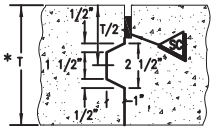
(A) EXPANSION JOINT



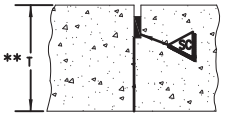
(C) TRANSVERSE CONTRACTION JOINT
(TRANSVERSE WEAKENED PLANE JOINT)



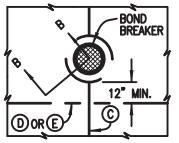
(E) LONGITUDINAL CONTRACTION JOINT
(LONGITUDINAL WEAKENED PLANE JOINT)

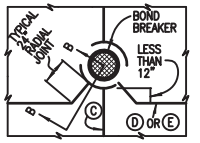


(D) LONGITUDINAL CONSTRUCTION JOINT
* TO BE USED ONLY IF T ≥ 8 INCHES
ONLY FEMALE KEYWAY TO BE FORMED

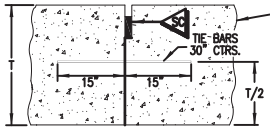


(F) LONGITUDINAL CONSTRUCTION JOINT
** TO BE USED ONLY IF T < 8 INCHES



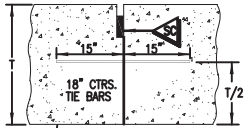


INLET OR MANHOLE CAST IN PAVEMENT

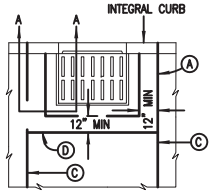


(L) LONGITUDINAL CONSTRUCTION JOINT

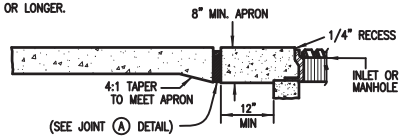
A KEYWAY IS ALLOWED TO FACILITATE USE OF BENT, GRADE 40 TIE BARS OR APPROVED TWO PIECE CONNECTORS



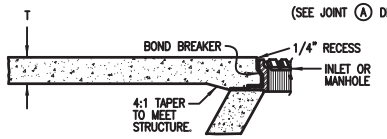
(T) TRANSVERSE CONSTRUCTION JOINT



CURB INLET BOXOUT

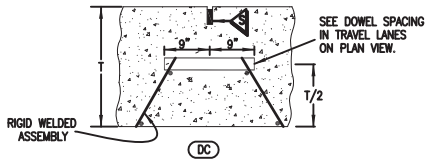


SECTION A–A

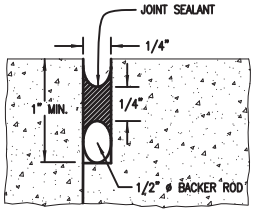


SECTION B–B

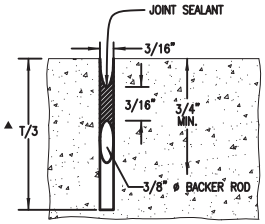
BOND BREAKER SHALL BE COMPOSED OF PLASTIC SHEET, BUILDING PAPER OR OTHER APPROVED MATERIAL TO PREVENT BONDING.



DOWELED TRANSVERSE CONTRACTION JOINT



SEAL AT CONSTRUCTION JOINT SC



▲ SHALL BE 0.4T FOR LONGITUDINAL JOINTS ALONG SLABS 14 FEET OR GREATER IN WIDTH.

SAWED JOINT SC

REFERENCE:

CDOT M & S STANDARDS

M-412-1

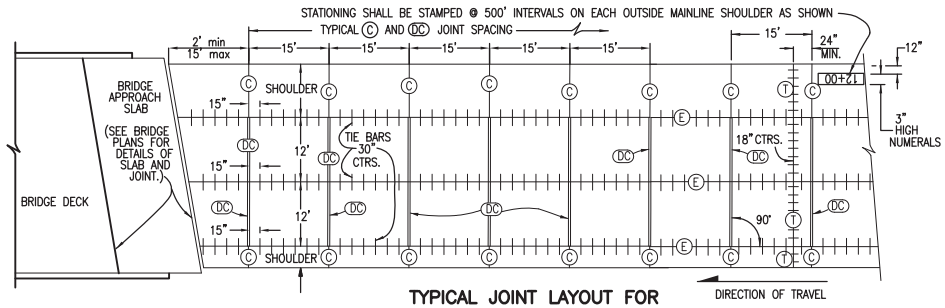
TYPICAL CONCRETE JOINT LAYOUT

DOUGLAS COUNTY COLORADO

Issued: 05/2013

Revised: _____

Drawing No. **SP.33a**



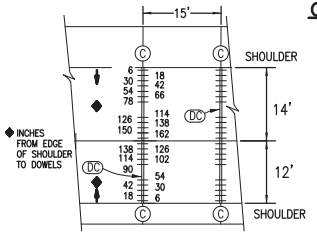
TYPICAL JOINT LAYOUT FOR CONCRETE ROADWAY WITH CONCRETE SHOULDERS

GENERAL NOTES

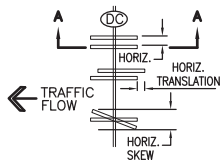
1. THIS STANDARD PLAN DOES NOT APPLY TO THIN CONCRETE OVERLAYS (WHITETOPPING).
2. LOCATE (T) JOINT AT A (C) JOINT OR A MINIMUM OF 2 FEET FROM A (C) JOINT.
3. THIS JOINT LAYOUT IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAVEMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER. 14 FOOT SLABS SHALL BE CONSTRUCTED ONLY WHERE DESIGNATED ON THE PLANS.
4. WHEN A CONTINUOUS WIDTH OF PAVEMENT IS POURED WIDER THAN 40 FEET, THE JOINT NEAREST THE CENTERLINE SHALL BE AN UNTIED (D) JOINT.
5. ON 4 LANE DIVIDED HIGHWAYS, THE 2 LANE DIRECTIONAL PAVEMENT AND BOTH SHOULDERS SHALL BE PLACED WITH (E) LONGITUDINAL SAWED CONTRACTION JOINTS.
6. ON VARIABLE WIDTH SLABS, THE 2 FOOT OR 4 FOOT END OF SLAB WIDTH DIMENSION MAY VARY ±6 INCHES.
7. (L) TO BE USED WHEN TRAFFIC LANE IS ADDED SEPARATELY OR FOR TAPERS OR SPEED CHANGE LANES. ALTERNATIVE LONGITUDINAL JOINT LOCATIONS AT SPEED CHANGE LANE MAY BE USED IF APPROVED.

JOINT LEGEND

- (C) TRANSVERSE CONTRACTION
- (D) LONGITUDINAL CONSTRUCTION
- (DC) DOWELED TRANSVERSE CONTRACTION
- (L) (E) LONGITUDINAL CONSTRUCTION OR LONGITUDINAL CONTRACTION
- (T) TRAVERSE CONSTRUCTION

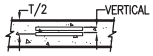


DOWEL BAR DETAIL FOR (DC) JOINT WITH 14 ft. AND 12 ft. LANES



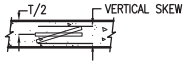
PLAN VIEW

SHOWING HORIZ. TRANSLATION, AND HORIZ. SKEW TOLERANCES



SECTION A–A

SHOWING VERTICAL TOLERANCE



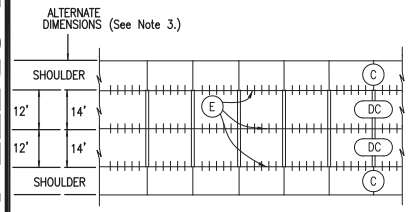
T IS PAVEMENT THICKNESS FROM PLANS

SECTION A–A

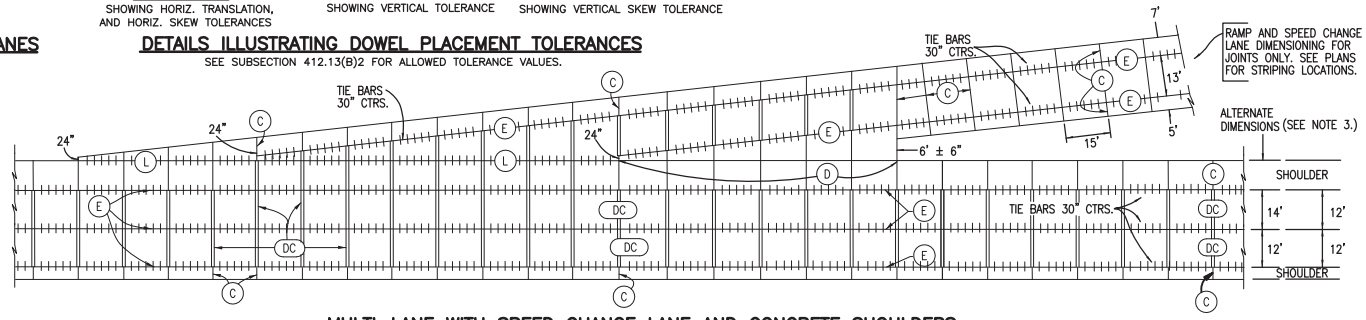
SHOWING VERTICAL SKEW TOLERANCE

DETAILS ILLUSTRATING DOWEL PLACEMENT TOLERANCES

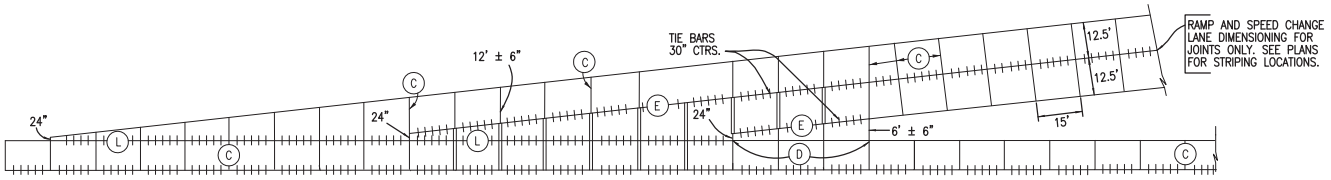
SEE SUBSECTION 412.13(B)2 FOR ALLOWED TOLERANCE VALUES.



RURAL TWO–LANE



MULTI–LANE WITH SPEED CHANGE LANE AND CONCRETE SHOULDERS



OPTIONAL LONGITUDINAL JOINT IN CENTER FOR SINGLE LANE SPEED CHANGE LANE

REFERENCE:

CDOT M & S STANDARDS

M-412-1

DOUGLAS COUNTY
COLORADO

TYPICAL CONCRETE JOINT LAYOUT

Issued: 05/2013

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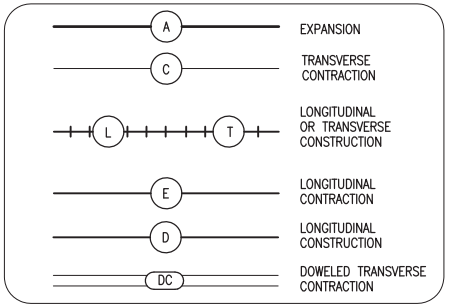
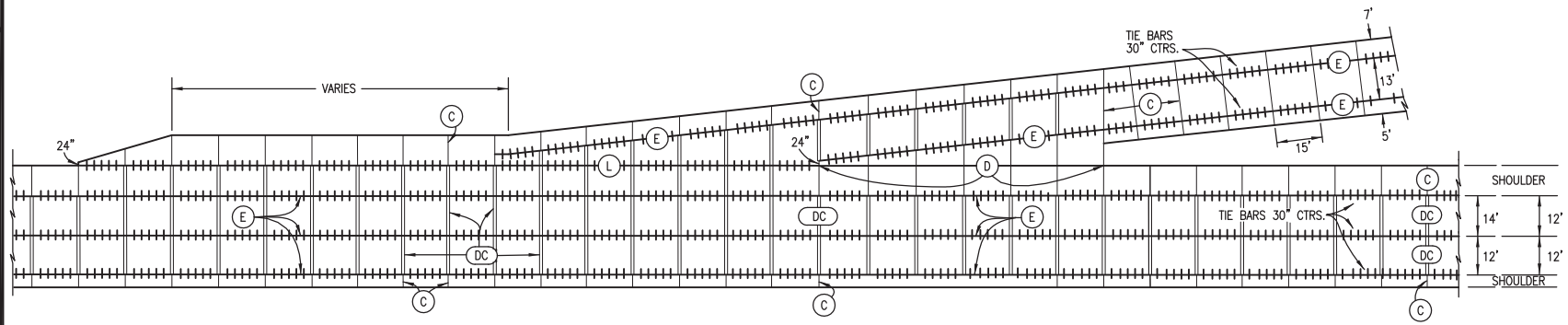
Drawing No.
SP.33b

JOINT LEGEND

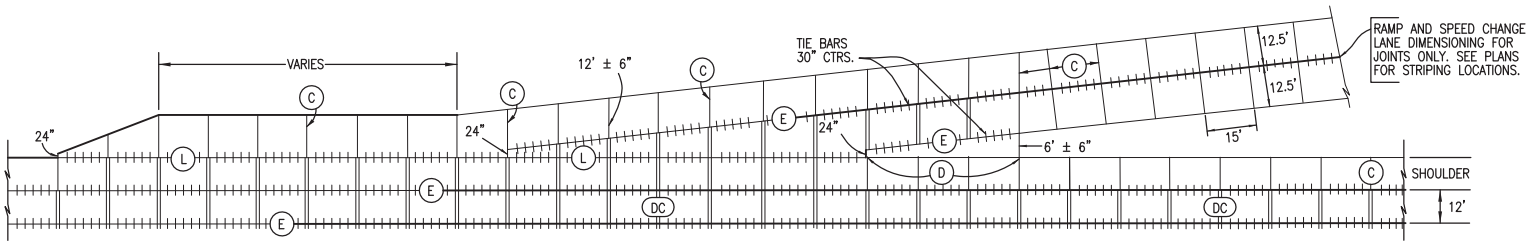


GENERAL NOTES

1. THIS STANDARD PLAN DOES NOT APPLY TO THIN CONCRETE OVERLAYS (WHITETOPPING).
2. LOCATE (T) JOINT AT A (C) JOINT OR A MINIMUM OF 2 FEET FROM A (C) JOINT.
3. THIS JOINT LAYOUT IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAVEMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER. 14 FOOT SLABS SHALL BE CONSTRUCTED ONLY WHERE DESIGNATED ON THE PLANS.
4. WHEN A CONTINUOUS WIDTH OF PAVEMENT IS POURED WIDER THAN 40 FEET, THE JOINT NEAREST THE CENTERLINE SHALL BE AN UNTIED (D) JOINT.
5. ON 4 LANE DIVIDED HIGHWAYS, THE 2 LANE DIRECTIONAL PAVEMENT AND BOTH SHOULDERS SHALL BE PLACED WITH (E) LONGITUDINAL SAWED CONTRACTION JOINTS.
6. ON VARIABLE WIDTH SLABS, THE 2 FOOT OR 4 FOOT END OF SLAB WIDTH DIMENSION MAY VARY ±6 INCHES.
7. (L) TO BE USED WHEN TRAFFIC LANE IS ADDED SEPARATELY OR FOR TAPERS OR SPEED CHANGE LANES. ALTERNATIVE LONGITUDINAL JOINT LOCATIONS AT SPEED CHANGE LANE MAY BE USED IF APPROVED.



MULTI–LANE WITH ACCELERATION AND DECELERATION LANES AND CONCRETE SHOULDERS



OPTIONAL LONGITUDINAL JOINT IN CENTER FOR SINGLE LANE ACCELERATION AND DECELERATION LANE

REFERENCE:

CDOT M & S STANDARDS

M-412-1

DOUGLAS COUNTY
COLORADO

TYPICAL CONCRETE JOINT LAYOUT

Issued: 05/2013

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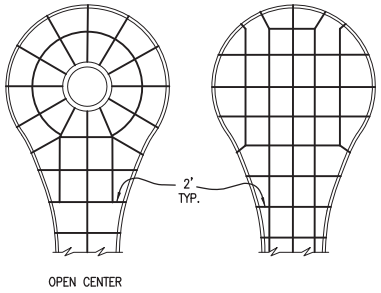
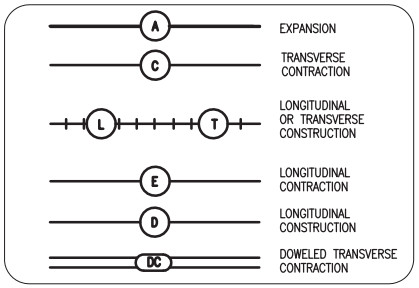
Drawing No.

SP.33c



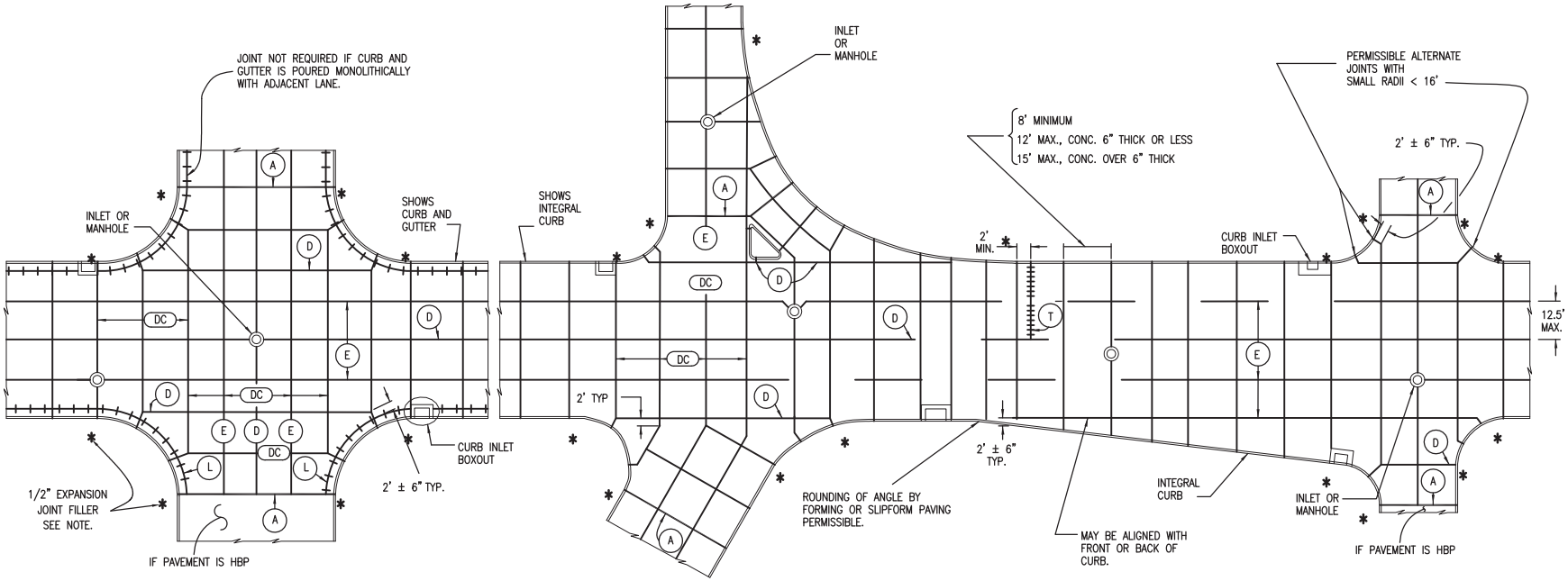
CUL-DE-SAC

JOINT LEGEND



GENERAL NOTES

1. THIS STANDARD DOES NOT APPLY TO THIN CONCRETE OVERLAYS (WHITETOPPING).
2. THIS TYPICAL JOINT LAYOUT IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAVEMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER.
3. LONGITUDINAL JOINTS SHALL COINCIDE WITH LANE MARKINGS WHEN POSSIBLE, AND HAVE MAXIMUM SPACING OF 12.5 FT. (15 FT. PERMITTED WITH MONOLITHIC CURB AND GUTTER).
4. CONSTRUCT TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE OF PAVEMENT AND EXTEND THROUGH THE CURB OR CURB AND GUTTER.
5. * PLACE 1/2 IN. MIN. EXPANSION JOINT FILLER IN TOP 6 IN. OF CURB JOINT AT INTERSECTION RETURN RADIUS POINTS.
6. THE CONTRACTOR SHALL, UNLESS OTHERWISE SHOWN ON THE PLANS, SELECT AND USE A BOND BREAKER AT INLETS, MANHOLES AND SIMILAR SIZE STRUCTURES. SMALLER STRUCTURES SUCH AS VALVE AND MONUMENT BOXES SHALL NOT REQUIRE A BOND BREAKER.
7. TRANSVERSE JOINTS SHALL BE LOCATED AT THE CENTER OF CIRCULAR MANHOLES AND INLETS. NO TRANSVERSE JOINT SHALL PASS WITHIN 4 FT. OF A MANHOLE.
8. WHERE A LONGITUDINAL JOINT WOULD PASS LESS THAN 1 FT. FROM A CAST-IN PAVEMENT MANHOLE OR SIMILAR SIZE STRUCTURE, A TYPICAL 2 FT. RADIAL JOINT, AS SHOWN IN THE DETAILS, SHALL BE USED.
9. LOCATE (T) JOINT AT (C) JOINT OR 2 FT. MIN FROM (C)
10. WHEN A CONTINUOUS WIDTH AT PAVEMENT IS POURED WIDER THAN 40 FT., THE JOINT NEAREST THE CENTERLINE SHALL BE AN UNTIED (D) JOINT.



TYPICAL CURBED PAVEMENT JOINT LAYOUT

GENERAL NOTES

1. THIS STANDARD DOES NOT APPLY TO CONCRETE OVERLAYS LESS THAN 6 FT. THICK (WHITETOPPING).
2. THIS TYPICAL JOINT LAYOUT IS INTENDED TO BE USED AS A STANDARD FOR THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAVEMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER.
3. LONGITUDINAL JOINTS SHALL COINCIDE WITH LANE MARKINGS WHEN POSSIBLE, AND HAVE MAXIMUM SPACING OF 12.5 FT. (15 FT. PERMITTED WITH MONOLITHIC CURB AND GUTTER).
4. CONSTRUCT TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE OF PAVEMENT AND EXTEND THROUGH THE CURB OR CURB AND GUTTER.
5. PLACE 1/2 IN. MIN. EXPANSION JOINT FILLER IN TOP 6 IN. OF CURB JOINT AT INTERSECTION RETURN RADIUS POINTS.
6. THE CONTRACTOR SHALL, UNLESS OTHERWISE SHOWN ON THE PLANS, SELECT AND USE A BOND BREAKER AT INLETS, MANHOLES AND SIMILAR SIZE STRUCTURES. SMALLER STRUCTURES SUCH AS VALVE AND MONUMENT BOXES SHALL NOT REQUIRE A BOND BREAKER.
7. TRANSVERSE JOINTS SHALL BE LOCATED AT THE CENTER OF CIRCULAR MANHOLES AND INLETS. NO TRANSVERSE JOINT SHALL PASS WITHIN 4 FT. OF A MANHOLE.
8. WHERE A LONGITUDINAL JOINT WOULD PASS LESS THAN 1 FT. FROM A CAST-IN PAVEMENT MANHOLE OR SIMILAR SIZE STRUCTURE, A TYPICAL 2 FT. RADIAL JOINT, AS SHOWN IN THE DETAILS, SHALL BE USED.
9. LOCATE (T) JOINT AT (C) JOINT OR 2 FT. MIN FROM (C)
10. WHEN A CONTINUOUS WIDTH AT PAVEMENT IS POURED WIDER THAN 40 FT., THE JOINT NEAREST THE CENTERLINE SHALL BE AN UNTIED (D) JOINT.

JOINT LEGEND

- (A) EXPANSION
- (C) TRANSVERSE CONTRACTION
- (L)–(T)–(L) TIED LONGITUDINAL OR TRANSVERSE CONSTRUCTION
- (E) LONGITUDINAL CONTRACTION
- (D) LONGITUDINAL CONSTRUCTION
- (DC) DOWELED TRANSVERSE CONTRACTION

MULTI-LANE INTERSECTION WITH SPEED CHANGE LANE AND CONCRETE SHOULDERS

REFERENCE:

CDOT M & S STANDARDS
M-412-1

TYPICAL CONCRETE JOINT LAYOUT

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

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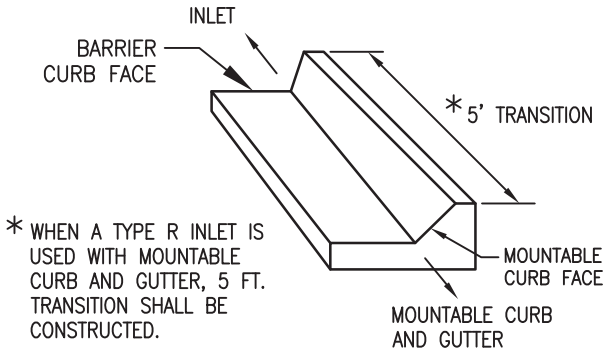
Drawing No.
SP.33d

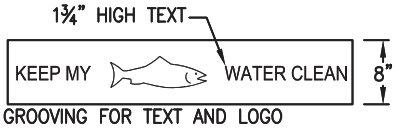


* WHEN A TYPE R INLET IS USED WITH MOUNTABLE CURB AND GUTTER, 5 FT. TRANSITION SHALL BE CONSTRUCTED.

TRANSITION CURB

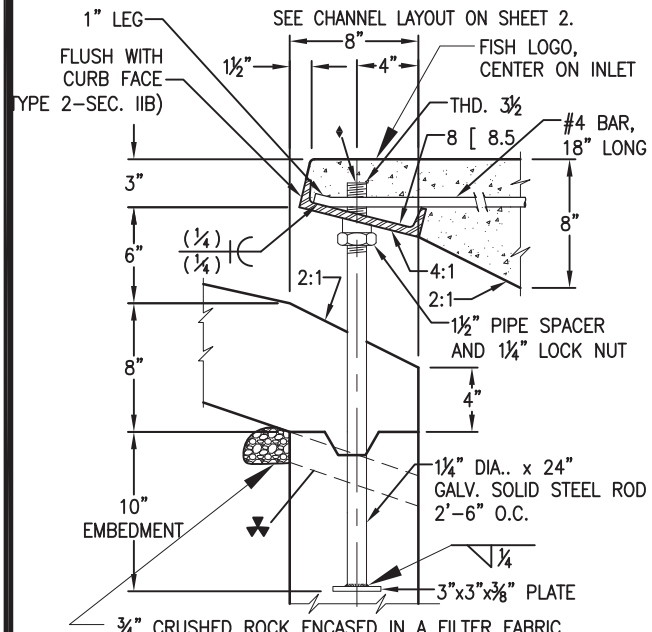
GENERAL NOTES:

SEE SHEET 2



GROOVING FOR TEXT AND LOGO SHALL BE ⅛" DEPTH AND ⅛" WIDTH

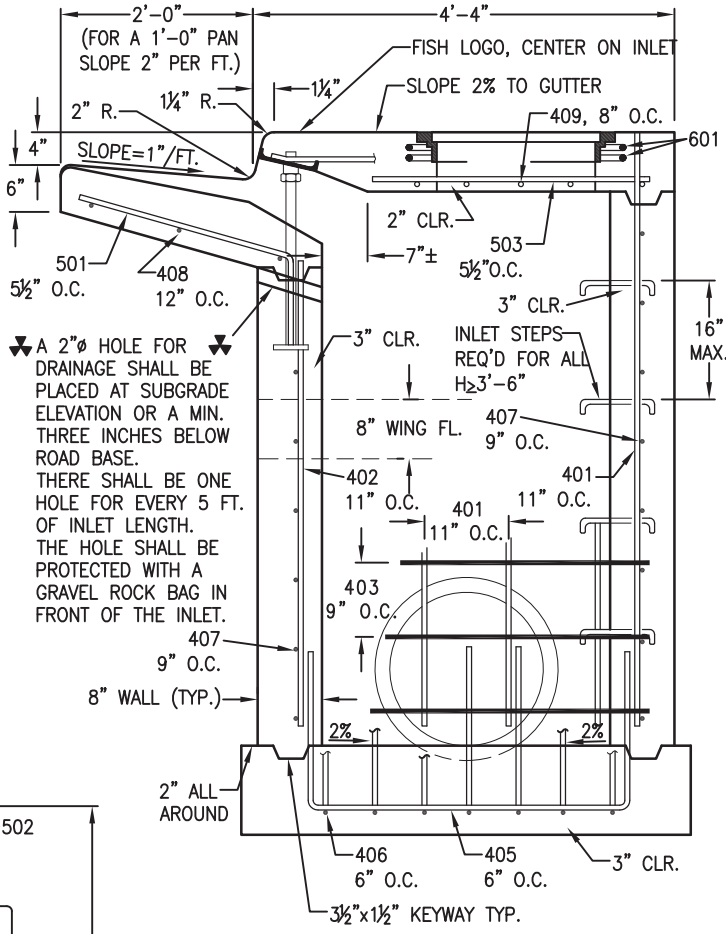
DETAIL FISH LOGO
NO SCALE



¾" CRUSHED ROCK ENCASED IN A FILTER FABRIC MATERIAL. BOTTOM OF ROCK SHALL NOT BE LOWER THAN HOLE.
LENGTH OF ROCK SHALL MATCH LENGTH OF INLET.
TO BE REMOVED PRIOR TO PORING OF GUTTER SECTION.

♦ PLACE ENTIRE ASSEMBLY BEFORE POURING CONCRETE.

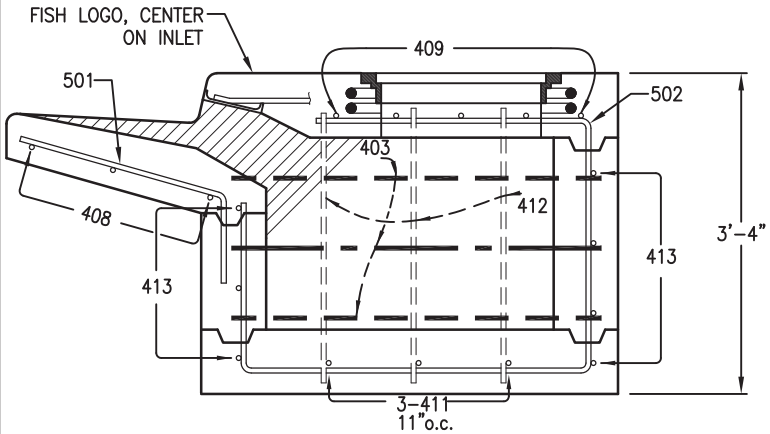
CURB FACE ASSEMBLY



♦ A 2"ø HOLE FOR DRAINAGE SHALL BE PLACED AT SUBGRADE ELEVATION OR A MIN. THREE INCHES BELOW ROAD BASE.
THERE SHALL BE ONE HOLE FOR EVERY 5 FT. OF INLET LENGTH.
THE HOLE SHALL BE PROTECTED WITH A GRAVEL ROCK BAG IN FRONT OF THE INLET.

SECTION B-B
END VIEW

NOTE: MANHOLE RING & COVER, STATION POINT AND OUTFLOW PIPE SHALL BE LOCATED AT THE SAME END OF THE INLET.



SECTIONS C-C & D-D

(DOTTED BARS ARE IN SECTION D-D)

REFERENCE:

CDOT M & S STANDARDS
M-604-12

CURB INLET - TYPE R (5', 10' OR 15' IN LENGTH)

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

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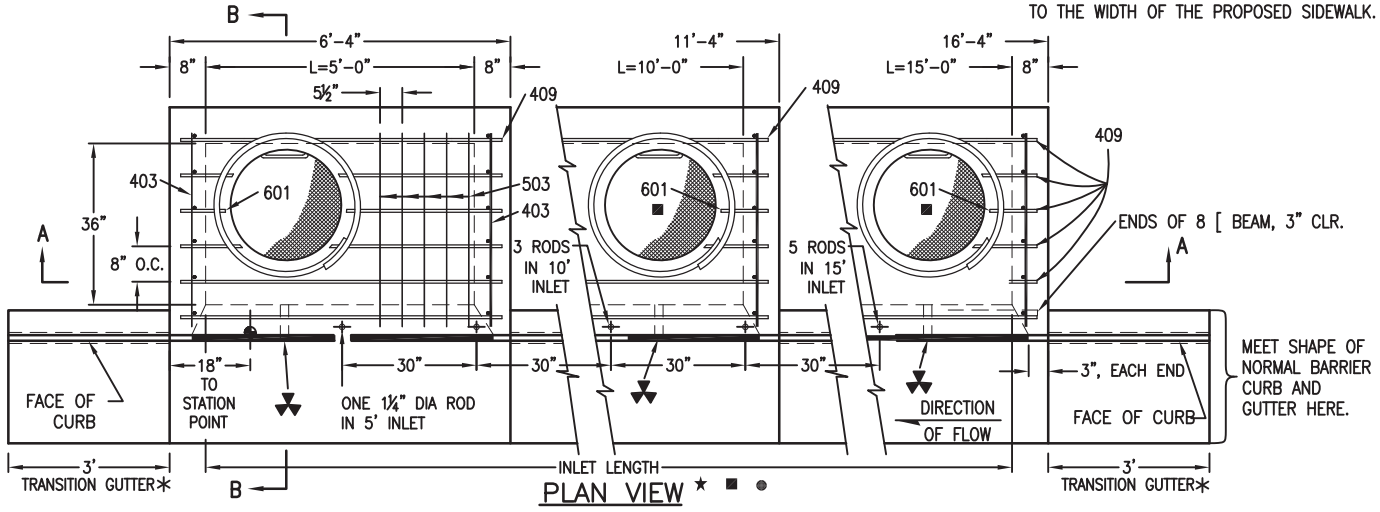
Drawing No.
SP.34a

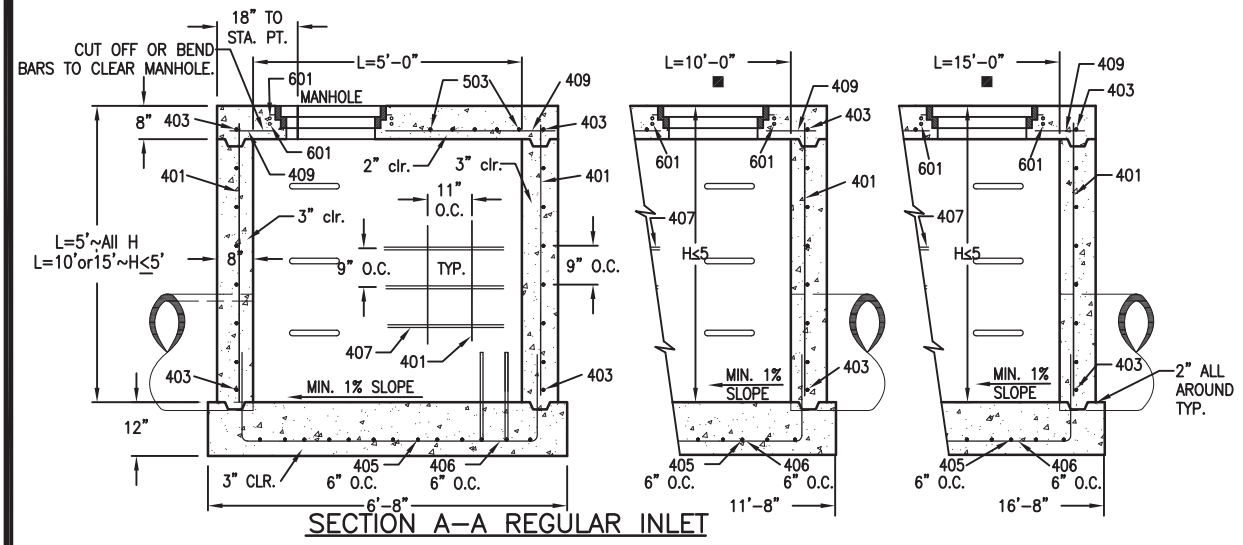
★ FOR LENGTH (L) GREATER THAN 5 FT. PROVIDE MAINTENANCE ACCESS AT BOTH ENDS.

■ ADDITIONAL MANHOLE RING AND COVER REQUIRED WHEN L=10 FT. OR MORE. CUT REINFORCEMENT BAR ACCORDINGLY.

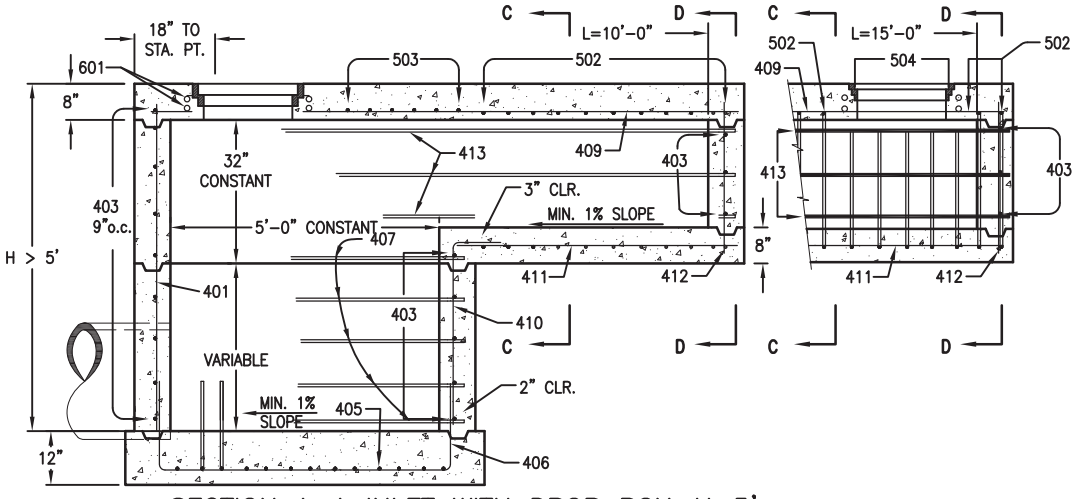
● INLET DECK SHALL BE FORMED AND POURED TO THE WIDTH OF THE PROPOSED SIDEWALK.



PLAN VIEW ★ ■ ●



SECTION A–A REGULAR INLET



SECTION A–A INLET WITH DROP BOX~H>5'

REFERENCE:

CDOT M & S STANDARDS
M-604-12

CURB INLET - TYPE R (5', 10' OR 15' IN LENGTH)

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

Drawing No.
SP.34b

MARK	BAR # OR SIZE	O.C. SPACING	TYPE	ALL INLETS		INLETS: H ≤ 5 FT.				INLETS: H > 5 FT.			
				L = 5 FT.		L = 10 FT.		L = 15 FT.		L = 10 FT.		L = 15 FT.	
				NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH
401	4	11"	II	15	*	21	*	26	*	11	*	11	*
402	4	11"	II	7	*	13	*	18	*	7	*	7	*
403	4	9 "	II	*	4'–0"	*	4'–0"	*	4'–0"	*	4'–0"	*	4'–0"
405	4	6 "	VI	11	6'–10"	21	6'–10"	31	6'–10"	11	6'–10"	11	6'–10
406	4	6 "	VIII	7	8'–10"	7	13'–10"	7	18'–10"	7	8'–10"	7	8'–10"
407	4	9 "	II	*	5'–10"	*	10'–10"	*	15'–10"	*	5'–10"	*	5'–10"
408	4	12"	II	3	6'–10"	3	11'–10"	3	16'–0"	3	11'–10"	3	16'–0"
409	4	8 "	II	6	5'–10"	6	10'–10"	6	15'–10"	6	10'–10"	6	15'–10"
410	4	11"	VII							3	*	3	*
411	4	11"	II							3	5'–2"	3	10'–2"
412	4	11"	II							3	2'–9"	3	2'–9"
413	4	9 "	II							7	10'–10"	7	15'–10"
501	5	5 1/2"	IV	11	3'–4"	22	3'–4"	33	3'–4"	22	3'–4"	33	3'–4"
502	5	5 1/2"	III							11	11'–5"	17	11'–5"
503	5	5 1/2"	II	5	3'–6"	16	3'–6"	27	3'–6"	6	3'–6"	6	3'–6"
504	5	5 1/2"	IX									5	8'–4"
601	6	2 1/2"	V	2	8'–10"	2	8'–10"	2	8'–10"	2	8'–10"	4	8'–10"
■8[8.5				1	5'–10"	1	10'–10"	1	15'–10"	1	10'–10"	1	15'–10"
				2 BARS, 1 ROD	——	4 BARS, 3 RODS	——	8 BARS, 5 RODS	——	4 BARS, 3 RODS	——	8 BARS, 5 RODS	——

* VARIABLE, REFER TO TABLE TWO.

■ INCLUDE #4, 18 IN. BARS (SEE CHANNEL LAYOUT).

REGULAR INLETS

DROP BOX INLETS

TABLE ONE ~ BAR LIST FOR CURB INLETS, TYPE "R"

'H'	LENGTH			NO. REQ'D. REGULAR		NO. REQ'D. DROP BOX		L=5'		L=10'		L=15'	
	401	402	410	403	407	403	407	CONC. CU. YDS.	STEEL LBS.	CONC. CU. YDS.	STEEL LBS.	CONC. CU. YDS.	STEEL LBS.
3'–0"	2'–8"	1'–8"		10	7			3.2	285	5.3	497	7.4	706
3'–6"	3'–2"	2'–2"		10	7			3.4	305	5.7	528	7.9	747
4'–0"	3'–8"	2'–8"		12	9			3.7	326	6.0	559	8.4	786
4'–6"	4'–2"	3'–2"		12	9			3.9	334	6.4	571	8.8	803
5'–0"	4'–8"	3'–8"		14	11			4.1	354	6.7	602	9.3	844
5'–6"	5'–2"	4'–2"	3'–5"	16	13	15	6	4.4	375	6.0	607	7.4	850
6'–0"	5'–8"	4'–8"	3'–11"	16	13	16	6	4.6	382	6.2	616	7.6	860
6'–6"	6'–2"	5'–2"	4'–5"	18	15	18	8	4.8	402	6.4	637	7.8	880
7'–0"	6'–8"	5'–8"	4'–11"	20	17	19	10	5.0	423	6.6	654	8.0	897
7'–6"	7'–2"	6'–2"	5'–5"	20	17	20	10	5.3	430	6.9	664	8.3	907
8'–0"	7'–8"	6'–8"	5'–11"	22	19	22	12	5.5	451	7.1	684	8.5	927
8'–6"	8'–2"	7'–2"	6'–5"	24	21	23	14	5.7	471	7.3	702	8.7	944
9'–0"	8'–8"	7'–8"	6'–11"	24	21	24	14	6.0	479	7.6	711	9.0	954
9'–6"	9'–2"	8'–2"	7'–5"	26	23	26	16	6.2	499	7.8	732	9.2	974
10'–0"	9'–8"	8'–8"	7'–11"	28	25	27	18	6.4	520	8.0	749	9.4	992
10'–6"	10'–2"	9'–2"	8'–5"	28	25	28	18	6.7	527	8.3	759	9.7	1001
11'–0"	10'–8"	9'–8"	8'–11"	30	27	30	20	6.9	547	8.5	779	9.9	1022

NOTES: FOR L=5 FT., L=10 FT., AND L=15 FT.
REGULAR INLETS: TOTAL QUANTITIES NEEDED ARE OUTSIDE THE HEAVY BLACK LINE.
DROP BOX INLETS: TOTAL QUANTITIES NEEDED ARE INSIDE THE HEAVY BLACK LINE.

STEEL WEIGHTS DO NOT INCLUDE STRUCTURAL STEEL CHANNEL.

TABLE TWO ~ BARS AND QUANTITIES VARIABLE WITH "H"

REFERENCE:

CDOT M & S STANDARDS
M-604-12

CURB INLET - TYPE R (5', 10' OR 15' IN LENGTH)

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

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Drawing No.
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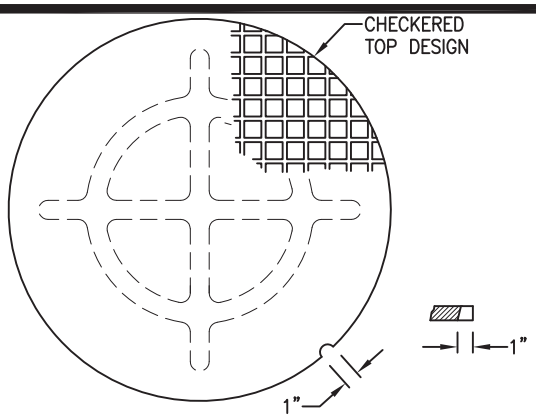
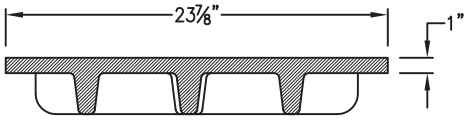
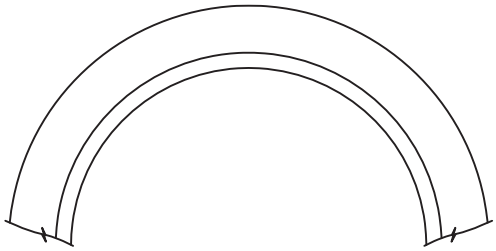


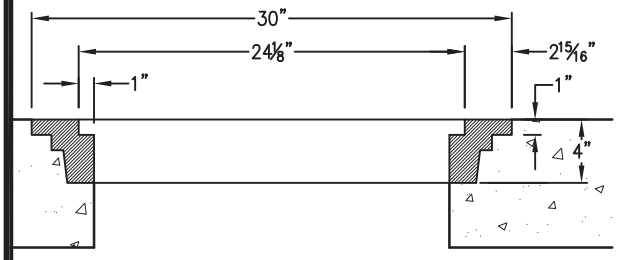
PLAN VIEW



ELEVATION VIEW
MANHOLE COVER (TYP.)



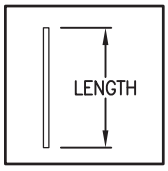
PLAN VIEW



WEIGHTS: COVER = 125 LBS.
+ RING = 135 LBS.
TOTAL = 260 LBS.

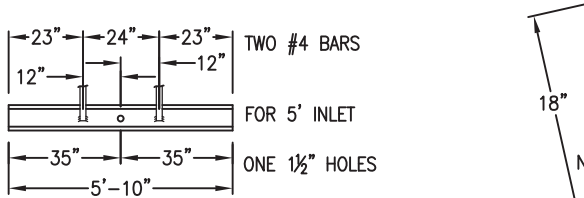
ELEVATION VIEW
MANHOLE RING (TYP.)

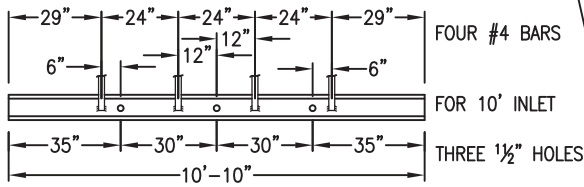
TYPE II

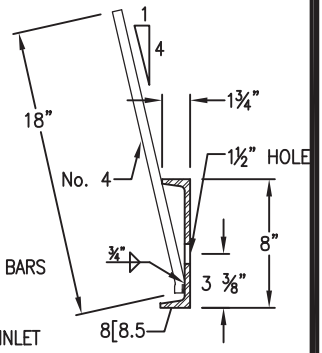


GENERAL NOTES

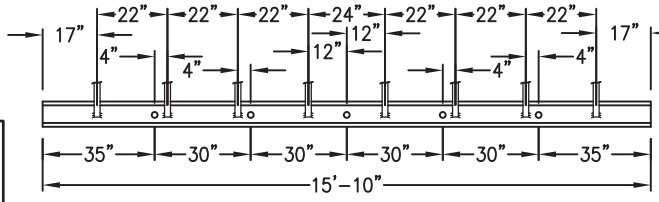
1. ALL CONCRETE SHALL BE CLASS D. INLET SHALL BE CAST-IN-PLACE.
2. CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES AND SHALL BE 8" THICK.
3. INLET STEPS SHALL BE IN CONFORMANCE WITH AASHTO M 199.
4. CURB FACE ASSEMBLY SHALL BE GALVANIZED AFTER WELDING.
5. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾". CURB AND GUTTER CORNERS SHALL BE FINISHED TO MATCH THE EXISTING CURB AND GUTTER BEYOND THE TRANSITION GUTTER.
6. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A 2" MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
7. DIMENSIONS AND WEIGHTS OF TYPICAL MANHOLE RING AND COVER ARE NOMINAL.
8. MATERIAL FOR MANHOLE RINGS AND COVERS SHALL BE GRAY OR DUCTILE CAST IRON IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS, SUBSECTION 712.06.
9. SINCE PIPE ENTRIES INTO THE INLET ARE VARIABLE, THE DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS AND QUANTITIES FOR CONCRETE AND REINFORCEMENT SHALL BE AS REQUIRED IN THE WORK. QUANTITIES INCLUDE VOLUMES OCCUPIED BY PIPES.
10. STRUCTURAL STEEL SHALL BE GALVANIZED AND SHALL BE IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS, SUBSECTION 712.06.
11. THE OUTSIDE WALL OF ANY PIPE THAT ENTERS OR EXITS THE INLET UNDER THE GUTTER SECTION NEEDS TO BE BELOW THE CURB FACE ASSEMBLY.
12. IF ANY REBAR HAS TO BE CUT ON THE JOB SITE, THE EXPOSED BARE STEEL SHALL BE IMMEDIATELY COVERED WITH A MANUFACTURE APPROVED EPOXY PAINT PRIOR TO POUR.
13. EXPANSION JOINT MATERIAL NEEDS TO BE PLACED BETWEEN THE OUTSIDE WALL OF THE INLET AND ANY SIDEWALK TO BE POURED NEXT TO THE INLET.
14. INLET LID SHALL MATCH ROADWAY SLOPE.
15. IF INLET FLOOR IS NOT SLOPED 1% TO OUTLET, CORRECTIVE MEASURES WILL NEED TO BE COMPLETED PER INSPECTIONS DIVISION.
16. IF TRENCH DRAIN IS INSTALLED WITH THE ROADWAY/DRAINAGE IMPROVEMENTS, THE TRENCH DRAIN SHALL BE CONNECTED PER THE TRENCH DRAIN CONNECTION TO INLET OR MANHOLE DETAIL.







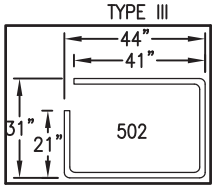
SECTION AT
HOLE (TYP.)



CHANNEL LAYOUT DETAILS

SEE CURB FACE ASSEMBLY ON SP.34a.

TYPE III



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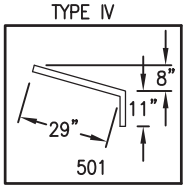
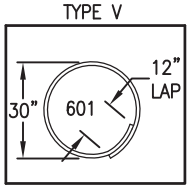
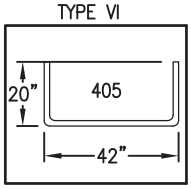


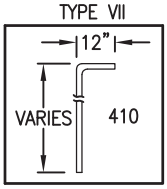
TYPE V



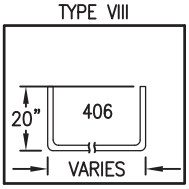
TYPE VI



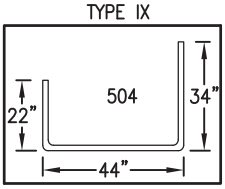
TYPE VII



TYPE VIII



TYPE IX



BAR BENDING DIAGRAMS ~ (Dimensions are Out-to-Out of bar)

REFERENCE:

CDOT M & S STANDARDS
M-604-12

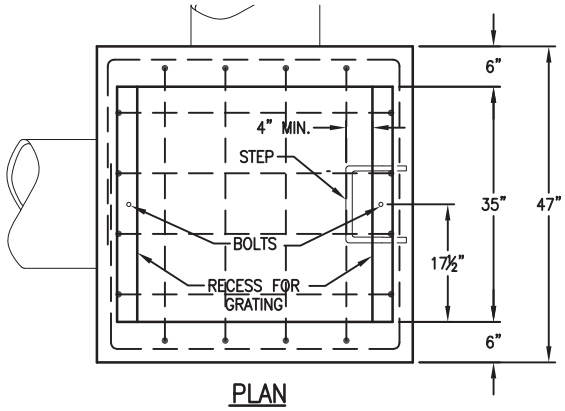
CURB INLET - TYPE R (5', 10' OR 15' IN LENGTH)

DOUGLAS COUNTY
COLORADO

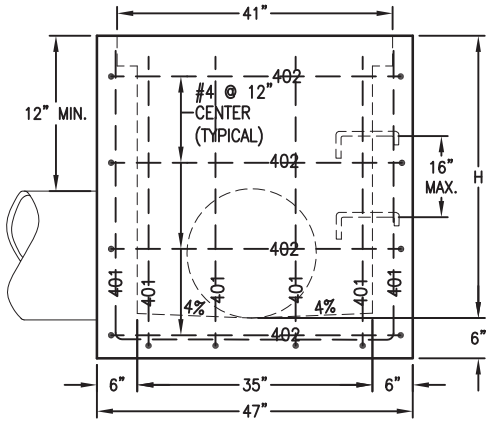
Issued: 05/2013

Revised: _____

Drawing No.
SP.34d



PLAN



ELEVATION
CONCRETE INLET

GENERAL NOTES

1. CONCRETE SHALL BE CLASS D. INLET SHALL BE CAST-IN-PLACE.
2. REINFORCING BARS SHALL BE EPOXY COATED AND DEFORMED #4, AND SHALL HAVE A MINIMUM 2 IN. CLEARANCE. CUT OR BEND AROUND PIPES AS REQUIRED. IF ANY REBAR HAS TO BE CUT ON THE JOB SITE, THE EXPOSED BARE STEEL SHALL BE IMMEDIATELY COVERED WITH A MANUFACTURE APPROVED EPOXY PAINT PRIOR TO POUR.
3. CONCRETE SLOPE PAVING SHALL INCLUDE FIBERMESH AT 1½ LBS/C.Y. OF CONCRETE.
4. STRUCTURAL STEEL FOR GRATES AND GRATE INSTALLATION HARDWARE SHALL BE GALVANIZED, AND SHALL BE IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS, SUBSECTION 712.06.
5. THE STANDARD INLET GRATES SHALL BE USED ON ALL TYPE C INLETS UNLESS CLOSE MESH GRATES ARE ACCEPTED BY DOUGLAS COUNTY THROUGH WRITTEN VARIANCE.
6. STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "H" IS EQUAL TO OR GREATER THAN 3 FT.-6 IN., AND SHALL CONFORM TO AASHTO M 199.
7. SEE STANDARD DETAIL SD-3, FOR REINFORCEMENT AROUND THE PIPE OPENING.

*- CONCRETE SLOPE AND DITCH PAVING WILL BE REQUIRED WHEN SHOWN ON PLANS.

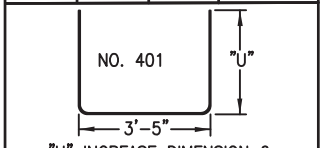
QUANTITIES FOR ONE INLET

H	CONCRETE (CU. YDS.) ▼	STEEL (LBS.) ▼	NO. STEPS REQ'D.
2'-6"	0.9	75	0
3'-0"	1.0	80	0
3'-6"	1.2	96	0
4'-0"	1.3	101	1
4'-6"	1.4	116	2
5'-0"	1.5	122	2
5'-6"	1.7	137	2
6'-0"	1.8	142	3
6'-6"	1.9	158	3
7'-0"	2.0	163	3
7'-6"	2.2	179	4
8'-0"	2.3	184	4
8'-6"	2.4	199	4
9'-0"	2.5	205	5
9'-6"	2.7	220	5
10'-0"	3.0	235	6
11'-6"	3.4	251	6

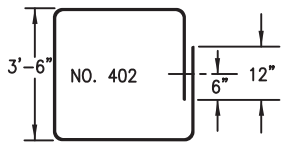
▼ PIPE INSIDE DIAMETER SHALL BE 30 IN. OR LESS. CONCRETE AND STEEL QUANTITIES ARE FOR ONE ENTIRE INLET BEFORE DEDUCTION FOR VOLUME OCCUPIED BY PIPE. WEIGHT OF STEEL INCLUDES A RING FOR THE MAXIMUM PIPE DIAMETER.

BAR LIST FOR H=2 FT-6 IN. AND BENDING DIAGRAM

MARK	NO. REQ'D.	HEIGHT	LENGTH
401	2	2'-3"	7'-11"
401	6	2'-7"	8'-7"
402	3	"U"	15'-0"



"U" INCREASE DIMENSION 6 IN. FOR EACH 6 IN. INCREASE OF "H" ABOVE 2 FT. - 6 IN.



ADD ONE BAR FOR EACH FT. INCREASE OF "H" ABOVE 2 FT. - 6 IN.

402 BARS WILL BE EQUALLY SPACED FROM EACH OTHER.

REFERENCE:

CDOT M & S STANDARDS
M-604-10

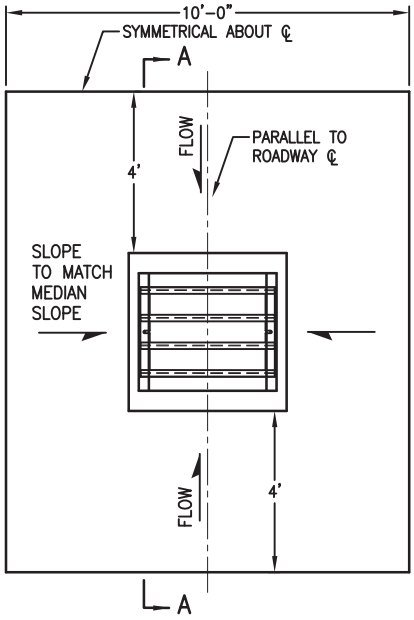
INLET TYPE C

DOUGLAS COUNTY
COLORADO

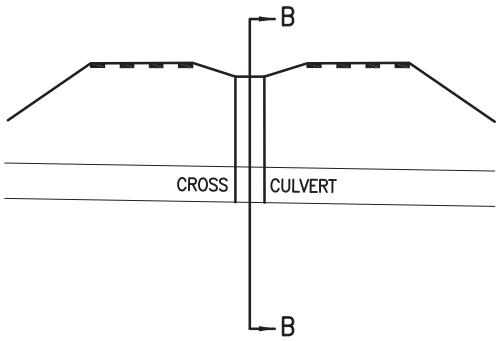
Issued: 05/2013

Revised: _____

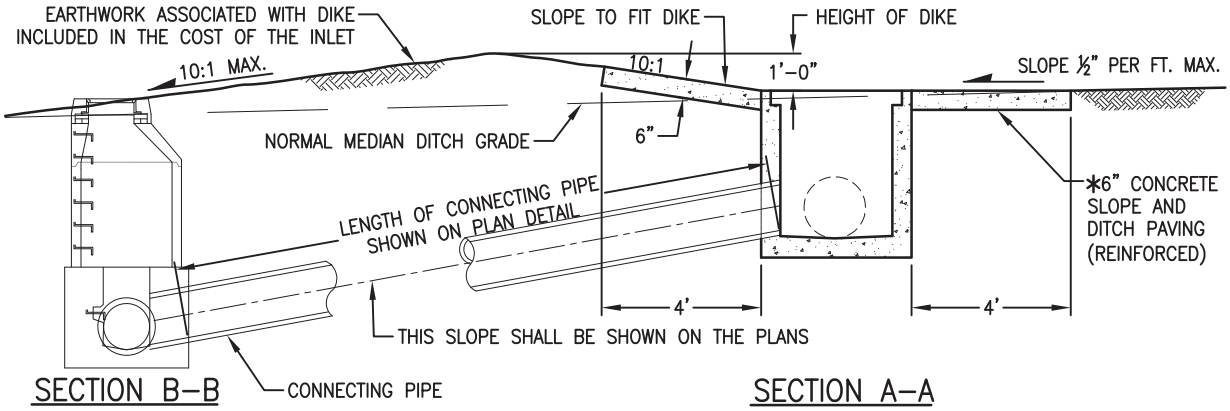
Drawing No.
SP.35a



INLET WITH DITCH PAVING



SECTION VIEW

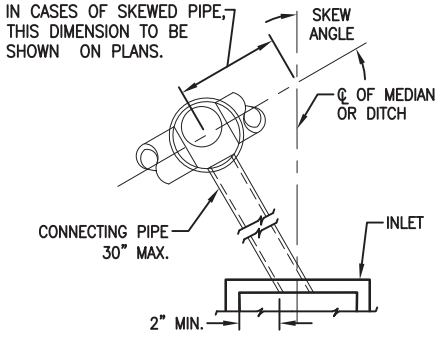


SECTION B–B

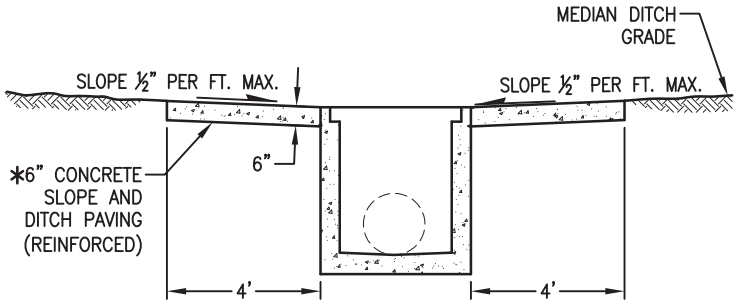
SECTION A–A

INLET CONNECTED TO A CROSS CULVERT

INLET ON GRADE (FLOW FROM ONE DIRECTION)



INLET CONNECTED TO A SKEWED CROSS CULVERT



SECTION A–A

INLET AT BOTTOM OF VERTICAL CURVE (FLOW FROM TWO DIRECTIONS)

REFERENCE:

CDOT M & S STANDARDS
M-604-10

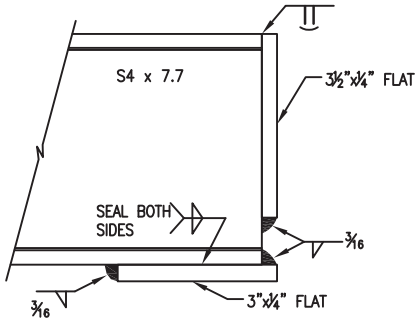
INLET TYPE C

DOUGLAS COUNTY
COLORADO

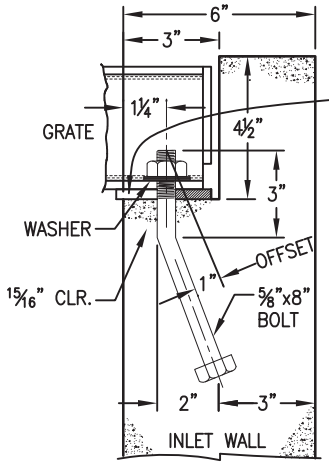
Issued: 05/2013

Revised:

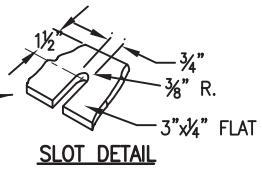
Drawing No.
SP.35b



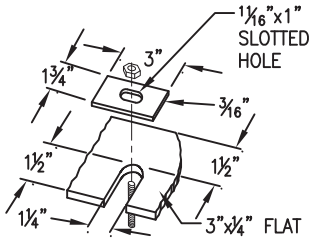
SECTION D–D



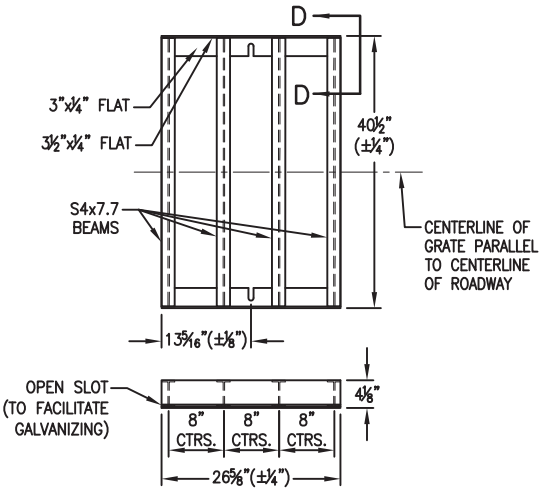
GRATE INSTALLATION DETAIL



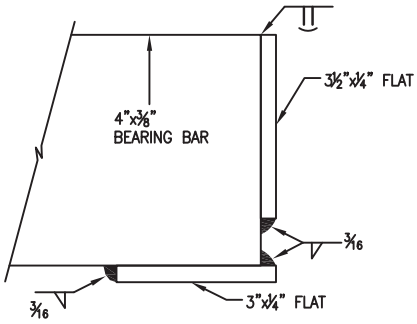
SLOT DETAIL



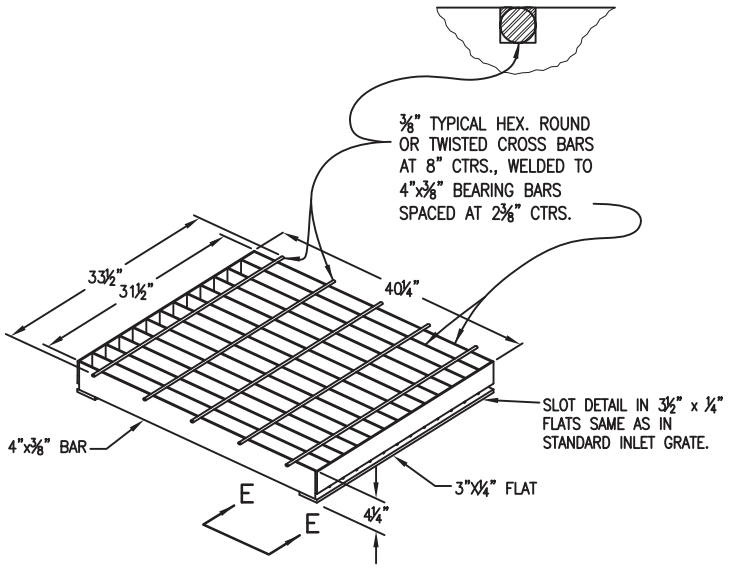
ALTERNATE SLOT AND HOLD DOWN PLATE DETAIL



STANDARD INLET GRATE



SECTION E–E



CLOSE MESH GRATE

USE FOR PEDESTRIAN AND BICYCLE AREAS ONLY.

REFERENCE:

CDOT M & S STANDARDS
M-604-10

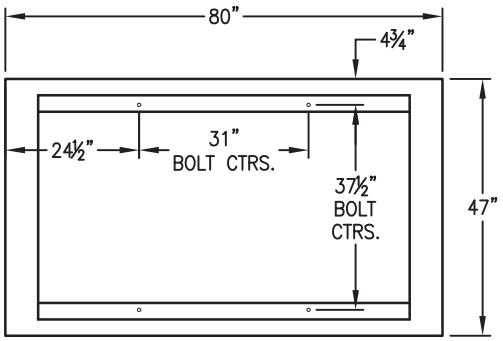
INLET TYPE C

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

Drawing No.
SP.35c

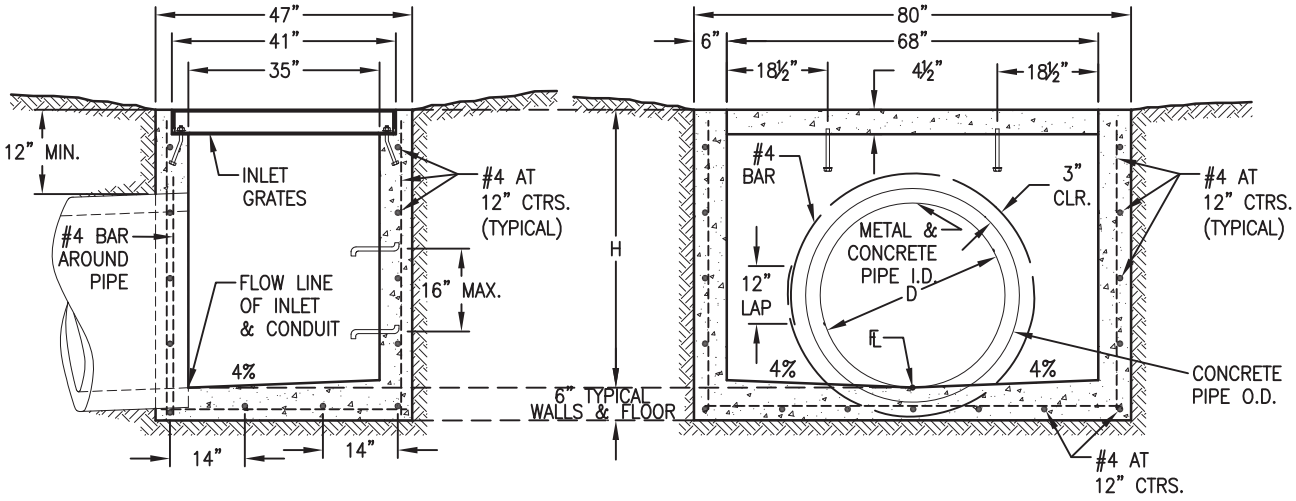


PLAN VIEW
(SHOWING ANCHOR BOLT LAYOUT)

OUTLET PIPE INSIDE DIA. IN. – "D"	MIN. "H" FT.
18	3.0
24	3.5
30	4.0
36	4.5
42	5.0

GENERAL NOTES

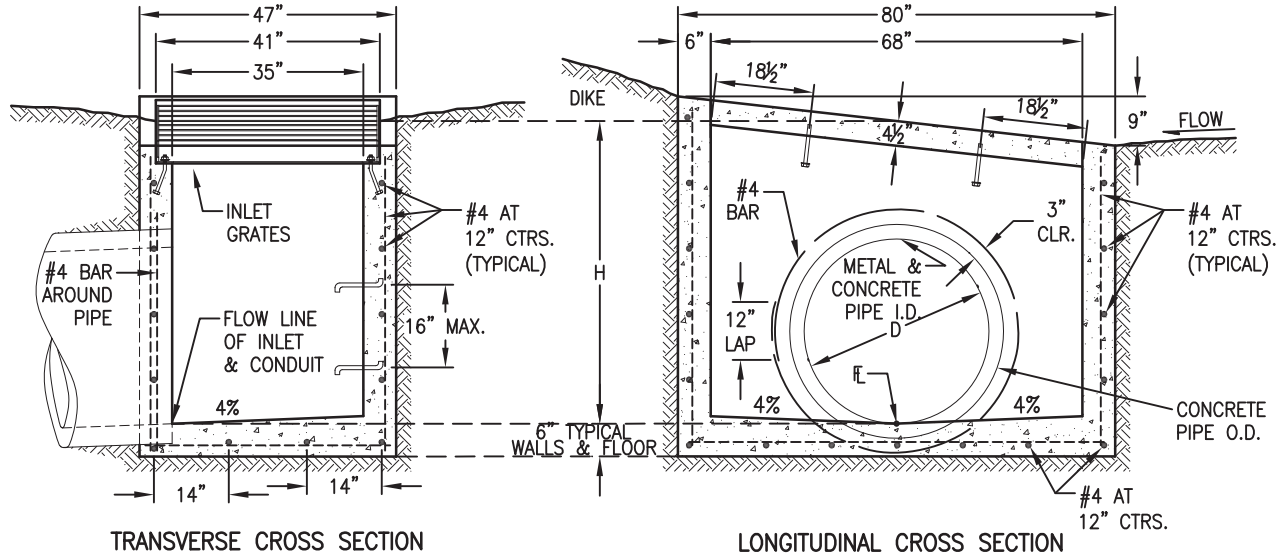
1. CONCRETE SHALL BE CLASS D INLET. INLET SHALL BE CAST– IN–PLACE.
2. STRUCTURAL STEEL FOR GRATES AND GRATE INSTALLATION HARDWARE SHALL BE GALVANIZED AND SHALL BE IN ACCORDANCE WITH COLORADO DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATION 712.06.
3. STANDARD INLET GRATES SHALL BE USED ON ALL TYPE D INLETS UNLESS CLOSE MESH GRATES ARE ACCEPTED BY DOUGLAS COUNTY THROUGH WRITTEN VARIANCE.
4. STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "H" EXCEEDS 3'–6" AND SHALL BE IN ACCORDANCE WITH AASHTO M 199.
5. REINFORCING BARS SHALL BE EPOXY COATED, AND DEFORMED, AND SHALL HAVE A 2" MINIMUM CLEARANCE. IF ANY REBAR HAS TO BE CUT ON THE JOB SITE, THE EXPOSED BARE STEEL SHALL BE IMMEDIATELY COVERED WITH A MANUFACTURE APPROVED EPOXY PAINT PRIOR TO POUR.



TRANSVERSE CROSS SECTION

LONGITUDINAL CROSS SECTION

LEVEL GRATE INSTALLATION



TRANSVERSE CROSS SECTION

LONGITUDINAL CROSS SECTION

SLOPING GRATE INSTALLATION

REFERENCE:

CDOT M & S STANDARDS
M-604-11

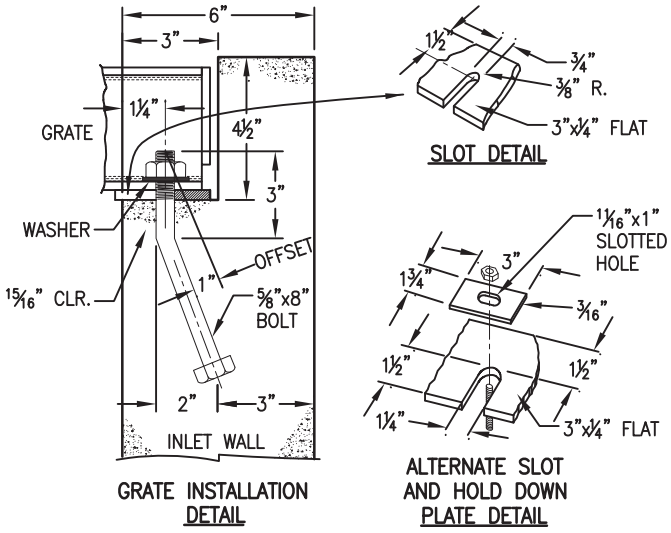
INLET TYPE D

DOUGLAS COUNTY
COLORADO

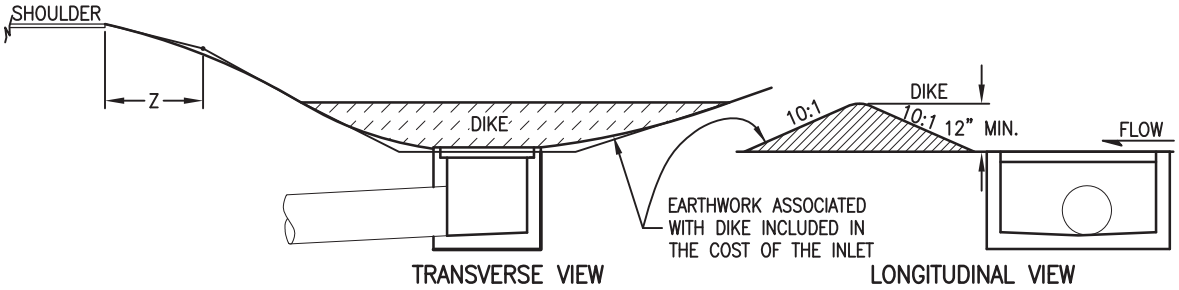
Issued: 05/2013

Revised: _____

Drawing No.
SP.36a



GRATE INSTALLATION DETAIL



DIKE

QUANTITIES FOR ONE INLET

H FT.	CONCRETE CU. YD. ▽	STEEL LB. ▽	CIRCULAR PIPE RANGE INSIDE DIA., IN. – "D"
3.0	1.5	127	18
3.5	1.7	149	18–24
4.0	1.9	157	18–30
4.5	2.0	179	18–36
5.0	2.2	187	18–42
5.5	2.4	208	18–42
6.0	2.6	215	18–42
6.5	2.8	236	18–42
7.0	2.9	243	18–42
7.5	3.1	264	18–42
8.0	3.3	271	18–42
8.5	3.5	292	18–42
9.0	3.6	299	18–42
9.5	3.8	320	18–42
10.0	4.0	327	18–42

▽ CONCRETE AND STEEL QUANTITIES ARE FOR ONE ENTIRE INLET BEFORE DEDUCTION FOR VOLUME OCCUPIED BY PIPE. WEIGHT OF STEEL INCLUDES A RING FOR THE MAXIMUM PIPE DIAMETER.

REFERENCE:

CDOT M & S STANDARDS
M-604-11

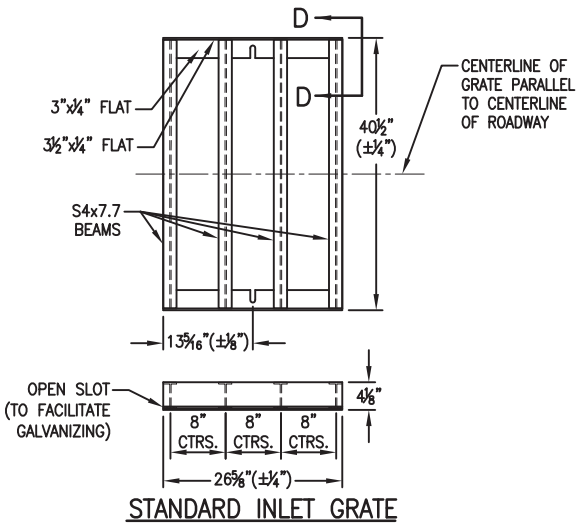
INLET TYPE D

DOUGLAS COUNTY
COLORADO

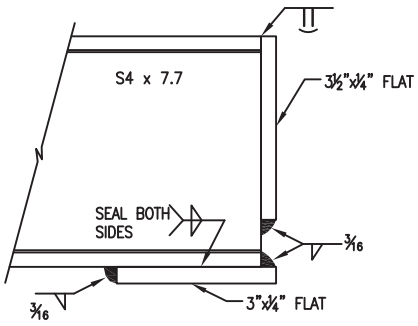
Issued: 05/2013

Revised:

Drawing No.
SP.36b



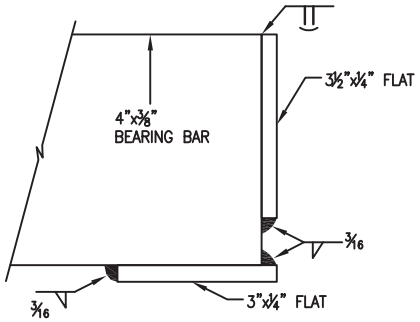
STANDARD INLET GRATE



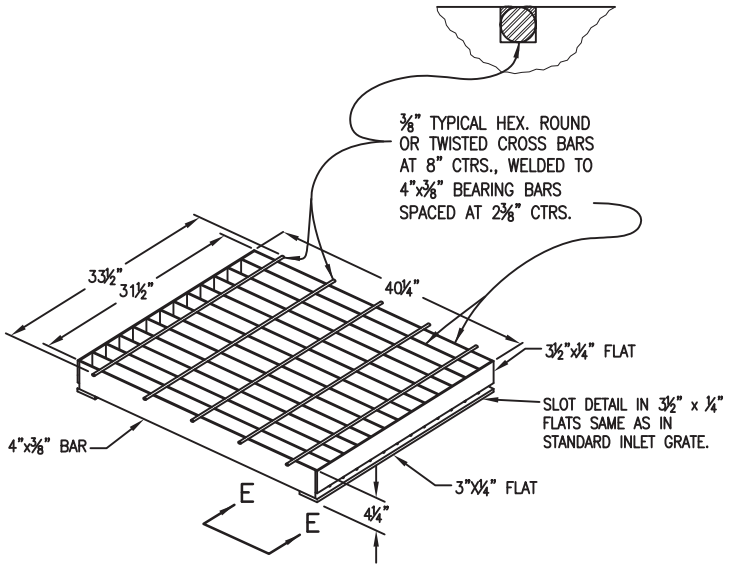
SECTION D–D

QUANTITIES: 2 STEEL GRATES PER INLET

NO. PIECES	DESCRIPTION	LENGTH	LB. PER FT.	WEIGHT (LBS.)
8	S4x7.7 BEAM	40"	7.70	206
4	3½"x½" FLAT	26⅝"	2.98	26
4	3"x½" FLAT	26⅝"	2.55	24
			TOTAL	256 LBS.



SECTION E–E



CLOSE MESH GRATE

USE FOR PEDESTRIAN AND BICYCLE AREAS ONLY.

REFERENCE:

CDOT M & S STANDARDS
M-604-11

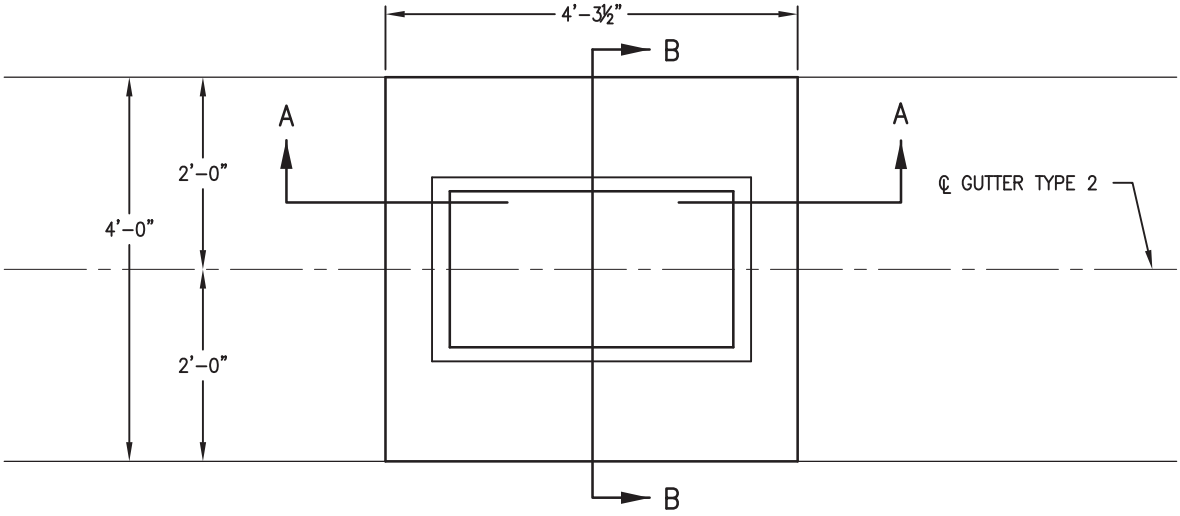
INLET TYPE D

DOUGLAS COUNTY
COLORADO

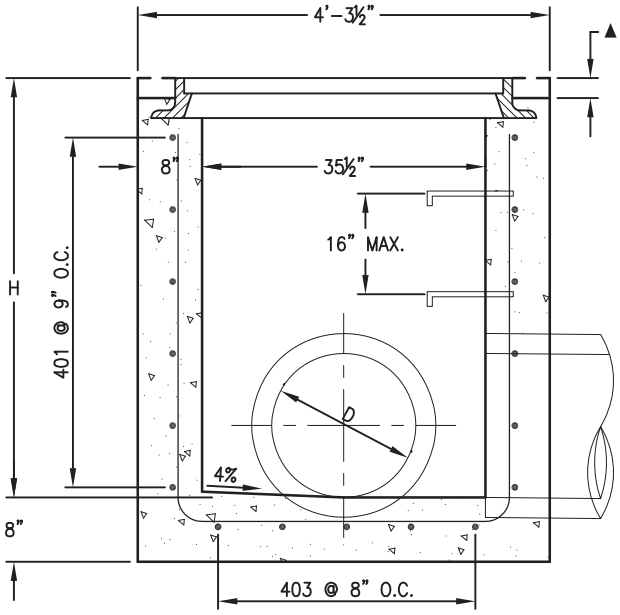
Issued: 05/2013

Revised: _____

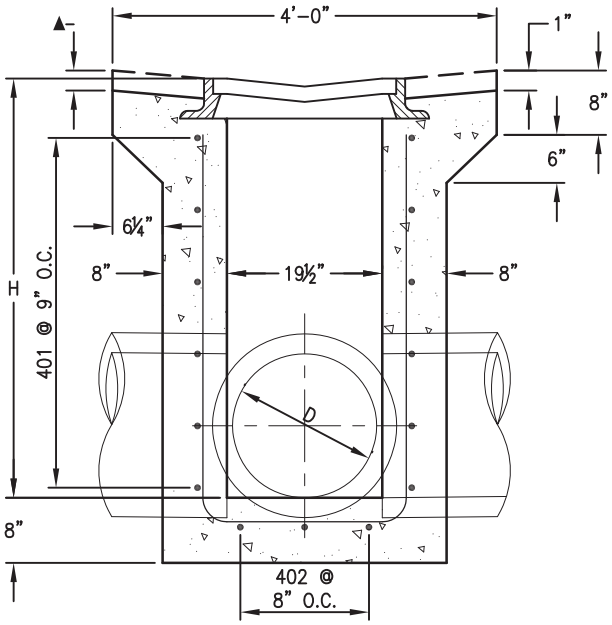
Drawing No.
SP.36c



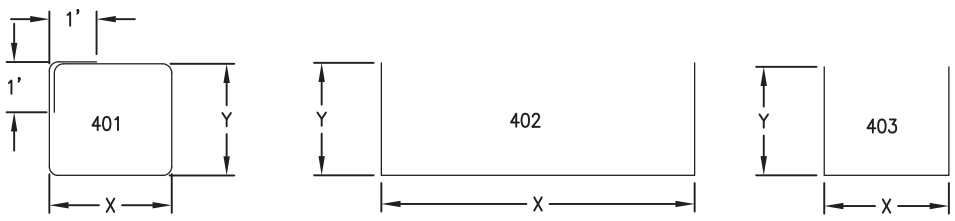
PLAN VIEW
TYPE 13 INLET FOR GUTTER TYPE 2



SECTION A–A
D MAX = 30" FOR H > 4 FT.



SECTION B–B
D MAX = 18" FOR ALL H



BENDING DIAGRAM
ALL DIMENSIONS ARE OUT-TO-OUT OF BAR.

REFERENCE:

CDOT M & S STANDARDS
M-604-13

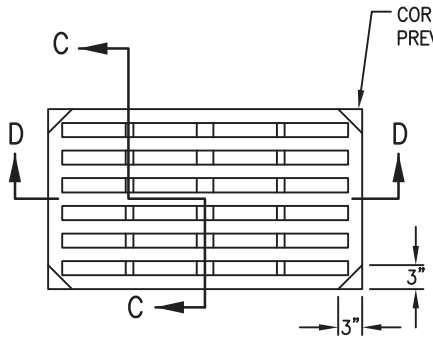
GRATED INLET TYPE 13

DOUGLAS COUNTY
COLORADO

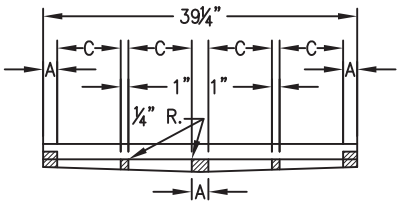
Issued: 05/2013

Revised:

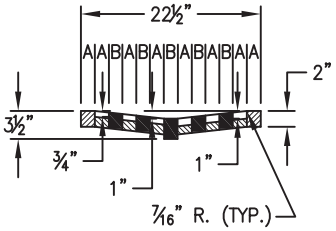
Drawing No.
SP.37a



NO. 13 GRATE



SECTION D–D



SECTION C–C

GENERAL NOTES

1. CONCRETE SHALL BE CLASS D. INLET SHALL BE CAST–IN–PLACE.
2. WALLS SHALL BE FORMED ON BOTH SIDES.
3. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
4. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A 2" MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
   IF ANY REBAR HAS TO BE CUT ON THE JOB SITE, THE EXPOSED BARE STEEL SHALL BE IMMEDIATELY COVERED WITH A MANUFACTURE APPROVED EPOXY PAINT PRIOR TO POUR.
5. STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "H" EXCEEDS 3'–6" AND SHALL BE IN ACCORDANCE WITH AASHTO M 199.
6. ALL GRATES AND FRAMES SHALL BE GRAY OR DUCTILE CAST IRON CONFORMING TO CDOT STANDARD SPECIFICATION, SUBSECTION 712.06. GRATES AND FRAMES SHALL BE DESIGNED TO WITHSTAND HS 20 LOADING.
7. SEE PLAN DETAILS FOR LOCATION AND SIZE OF PIPE.

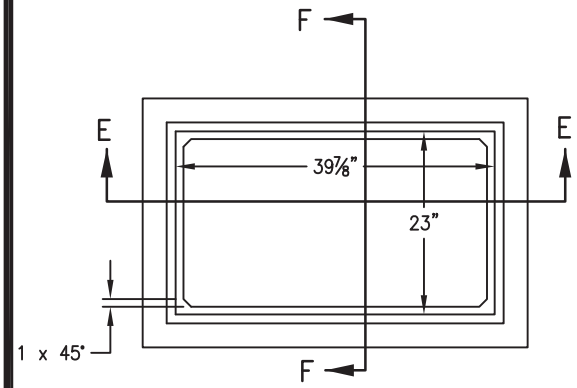
▲ WHEN BITUMINOUS MATERIAL IS TO EXTEND TO THE EDGE OF THE GRATING FRAME, CONCRETE MAY BE DEPRESSED.

QUANTITIES

H	CONCRETE CU. YD.	REINFORCING STEEL θ LB.	NO. OF 401 BARS REQ'D.	MAXIMUM PIPE I.D. SEC. A–A IN.	MAXIMUM PIPE I.D. SEC. B–B IN.
3'–0"	1.3	72	4	18	18
3'–6"	1.5	76	4	24	18
4'–0"	1.6	90	5	30	18
4'–6"	1.8	104	6	30	18
5'–0"	1.9	109	6	30	18
5'–6"	2.1	122	7	30	18
6'–0"	2.2	136	8	30	18
6'–6"	2.4	141	8	30	18
7'–0"	2.5	154	9	30	18
7'–6"	2.7	168	10	30	18
8'–0"	2.8	173	10	30	18
8'–6"	3.0	187	11	30	18
9'–0"	3.1	200	12	30	18
9'–6"	3.3	205	12	30	18
10'–0"	3.4	219	13	30	18

θ INCLUDES 1% FOR OVERRUN.

NOTE: CONCRETE QUANTITIES INCLUDE VOLUME OCCUPIED BY PIPE.

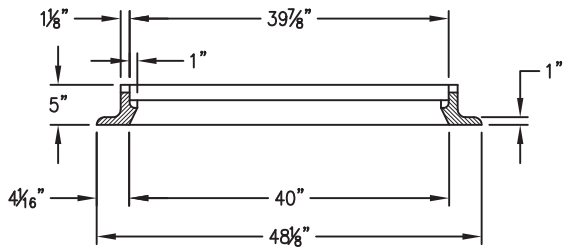


NO. 13 GRATING & FRAMES

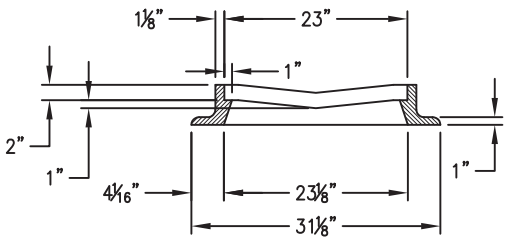
BAR LIST FOR H=3'–0"

MARK	NO. REQ'D.	DIMENSIONS X	DIMENSIONS Y	LENGTH
401	4	3'–6"	2'–2"	13'–4"
402	2	3'–4½"	*2'–6½"	8'–5½"
403	5	2'–½"	*2'–7"	7'–2½"

*ADD 6 IN. TO THIS DIMENSION FOR EACH 6 IN. INCREASE OF "H" OVER 3 FT.–0 IN.



SECTION E–E
APPROX. WEIGHT 590 LBS.



SECTION F–F

REFERENCE:

CDOT M & S STANDARDS
M-604-13

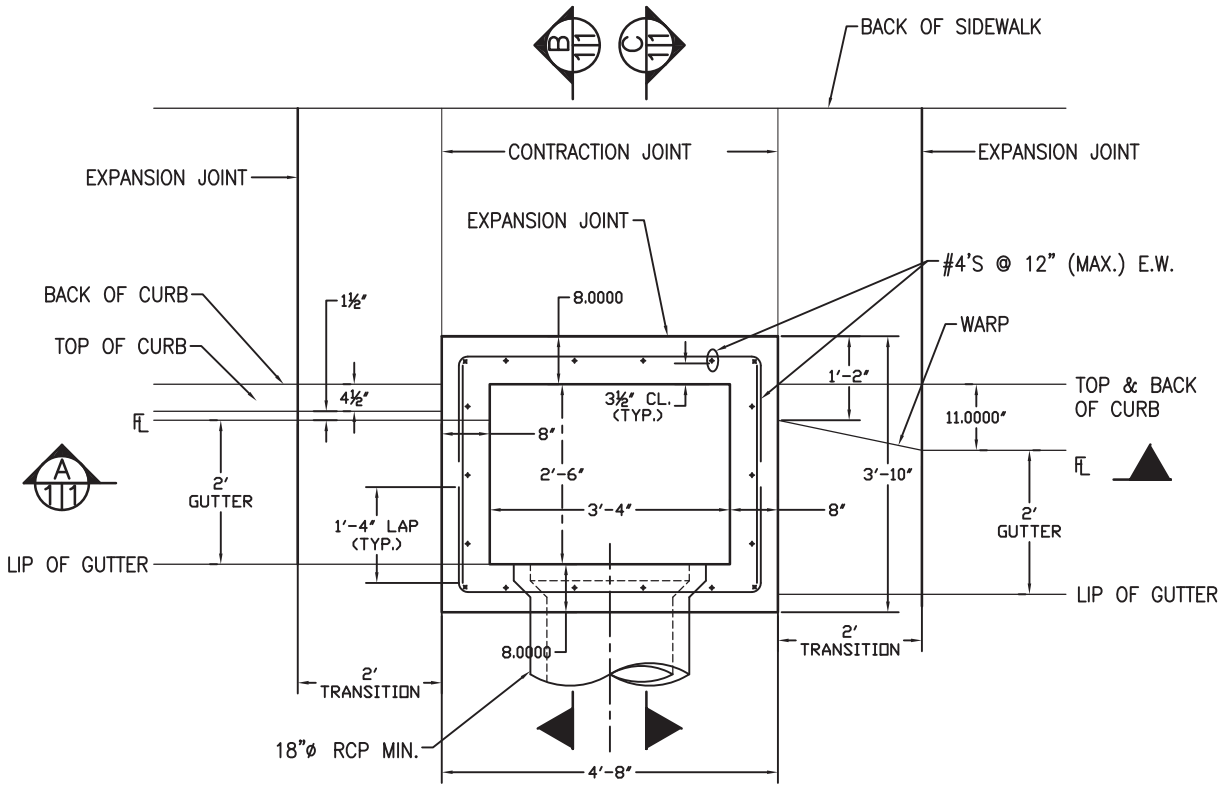
GRATED INLET TYPE 13

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

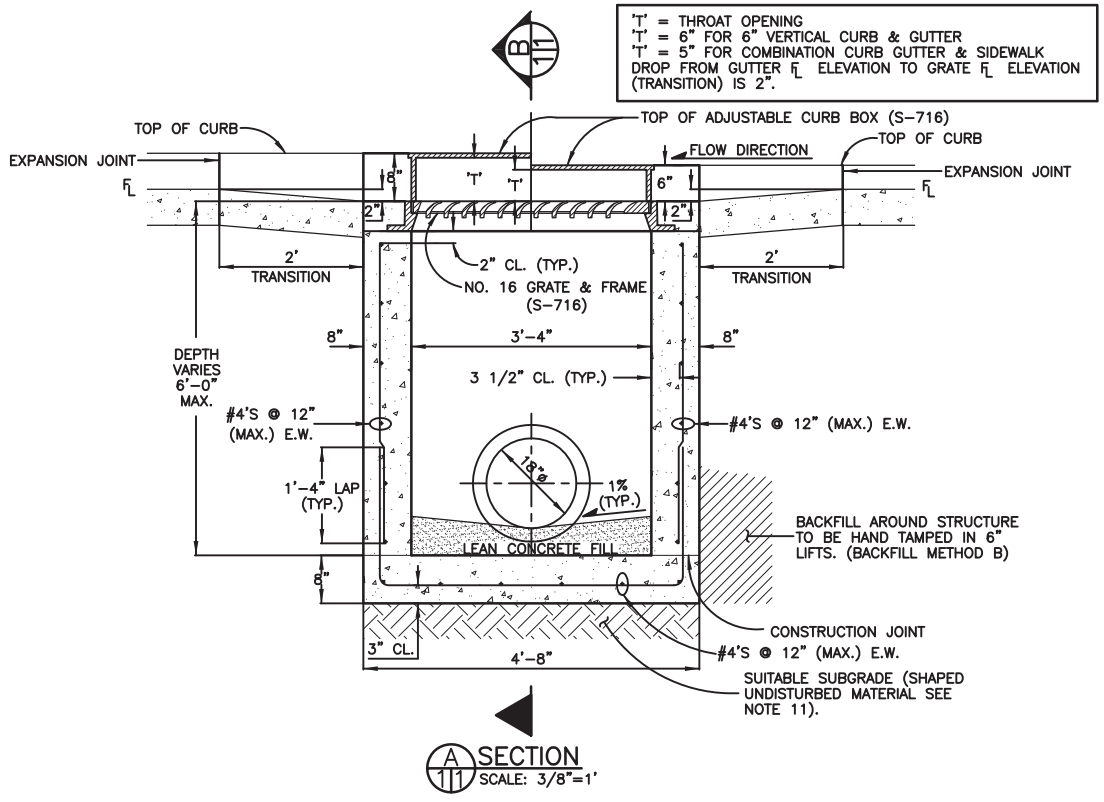
Drawing No.
SP.37b



VERTICAL CURB & GUTTER

PLAN VIEW
SCALE: 3/8"=1'

COMB. CURB, GUTTER & SIDEWALK



A 1 1 1 SECTION
SCALE: 3/8"=1'

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.1

COMBINATION INLET TYPE 13/ DENVER TYPE 16 - SINGLE NO. 16 OPEN THROAT INLET ADJUSTABLE CURB BOX

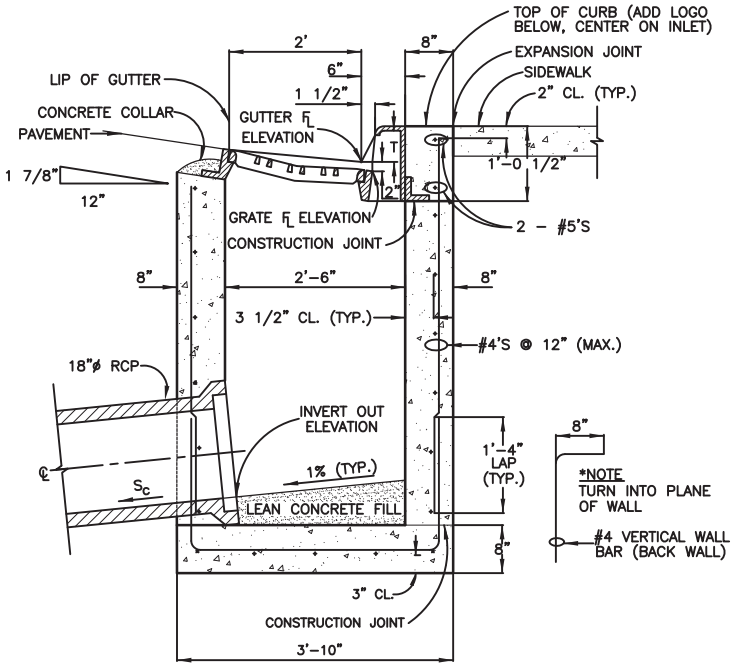
DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

Drawing No.
SP.38a

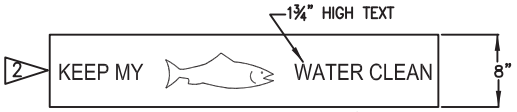
SEE STANDARD DETAIL S-716 FOR FRAME, GRATE & ADJUSTABLE CURB BOX DETAILS.



B SECTION
1 | 1 SCALE: 3/8"=1'

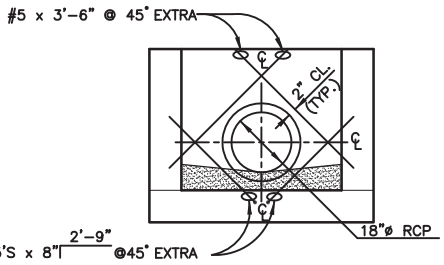
GENERAL NOTES

1. CONCRETE SHALL BE CLASS D. INLET SHALL BE CAST-IN-PLACE.
2. CAST-IN-PLACE CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES.
3. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
4. STEPS SHALL BE PROVIDED WHEN INLET DEPTH EXCEEDS 3'-6" AND SHALL BE IN ACCORDANCE WITH AASHTO M 199.
5. ALL GRATES AND FRAMES SHALL BE GRAY OR DUCTILE CAST IRON CONFORMING TO CDOT STANDARD SPECIFICATIONS, SUSECTION 712.06. GRATES AND FRAMES SHALL BE DESIGNED TO WITHSTAND HS 20 LOADING.
6. FLOOR SLOPE MAY BE POURED MONOLITHIC WITH BASE.
7. UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS OR OTHERWISE APPROVED, ALL #16 INLETS SHALL BE CONSTRUCTED WITH AN ADJUSTABLE C.I. CURB BOX (STANDARD DETAIL SD-9).
8. DESIGN CONDITIONS FOR INLET ALLOWS DEPTHS OF 6' (MAX.). FOR INLETS MORE THAN 6' IN DEPTH, SHOP DRAWINGS AND DESIGN ANALYSIS SHALL BE SUBMITTED FOR APPROVAL.
9. ALL REINFORCING STEEL SHALL BE ASTM, A-615, GRADE 60 DEFORMED BARS. DIAMETER OF BEND MEASURED ON THE INSIDE OF THE BAR SHALL BE A MINIMUM OF 6 BAR DIAMETER. REINFORCING BARS SHALL HAVE A 2" MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
10. ALL WORK SHALL CONFORM TO THE DOUGLAS COUNTY ROADWAY DESIGN AND CONSTRUCTION STANDARDS MANUAL, LATEST EDITION.
11. SUB-GRADE SHALL BE SHAPED UNDISTURBED MATERIAL OR OVEREXCAVATED AND BACKFILLED WITH CLASS B BEDDING MATERIAL.
12. NO FORMWORK SHALL REMAIN INSIDE STRUCTURE WHEN COMPLETE.
13. SPLICING OF REINFORCING STEEL SHALL BE PERMITTED ONLY WHERE DETAILED IN DRAWINGS.
14. INLET WALLS SHALL BE FORMED BOTH INSIDE AND OUTSIDE. CASTING OF SIDEWALLS AGAINST EARTH IS NOT PERMITTED.
15. LEAN CONCRETE FILL TO BE CLASS B.
16. THIS INLET IS NOT FOR USE IN COUNTY R.O.W.

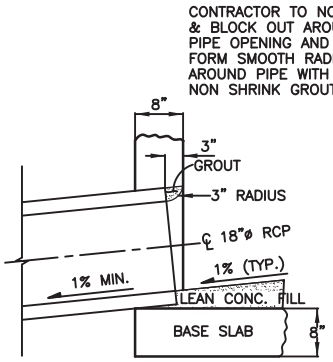


GROOVING FOR TEXT AND LOGO SHALL BE ⅛" DEPTH AND ⅛" WIDTH

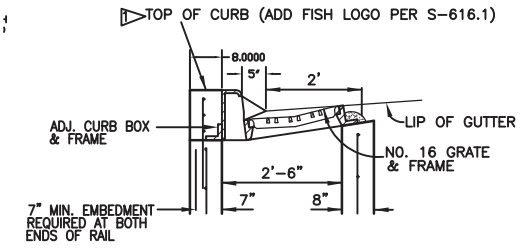
DETAIL FISH LOGO
NO SCALE



DETAIL REBAR PLACEMENT AROUND CONNECTOR
SCALE: 1/4"=1'



DETAIL CONNECTOR OUTLET
SCALE: 3/8"=1' (OPTIONAL)



C SECTION COMB CURB GUTTER & SIDEWALK
1 | 1 SCALE: 1/4" - 1'

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.1

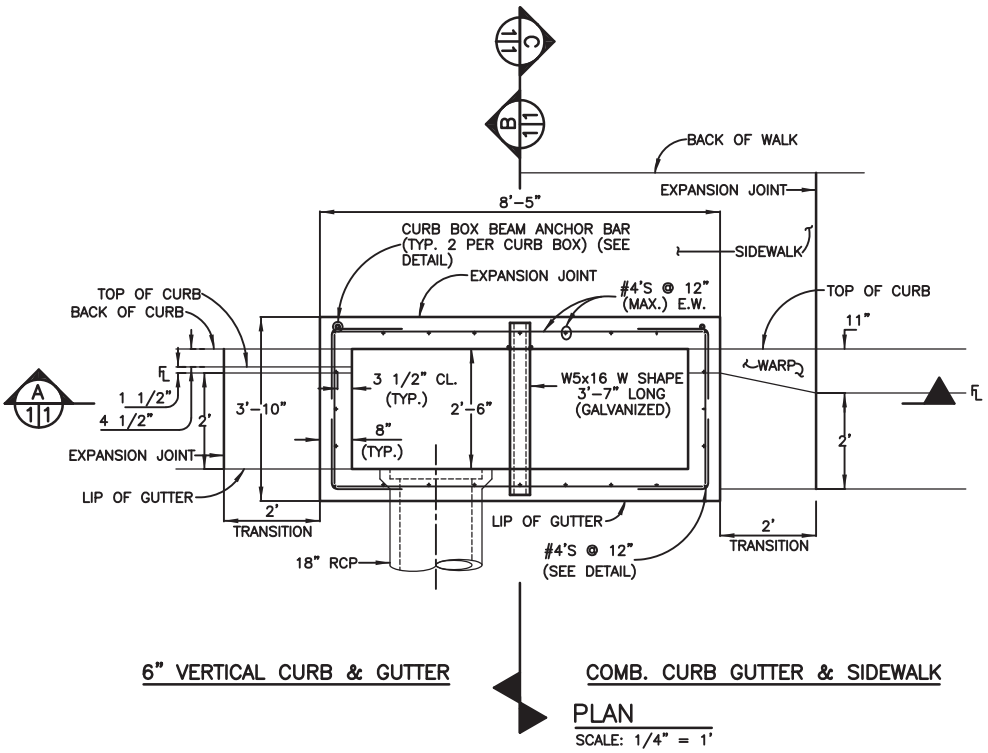
COMBINATION INLET TYPE 13/ DENVER TYPE 16 - SINGLE NO. 16 OPEN THROAT INLET ADJUSTABLE CURB BOX

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

Drawing No.
SP.38b

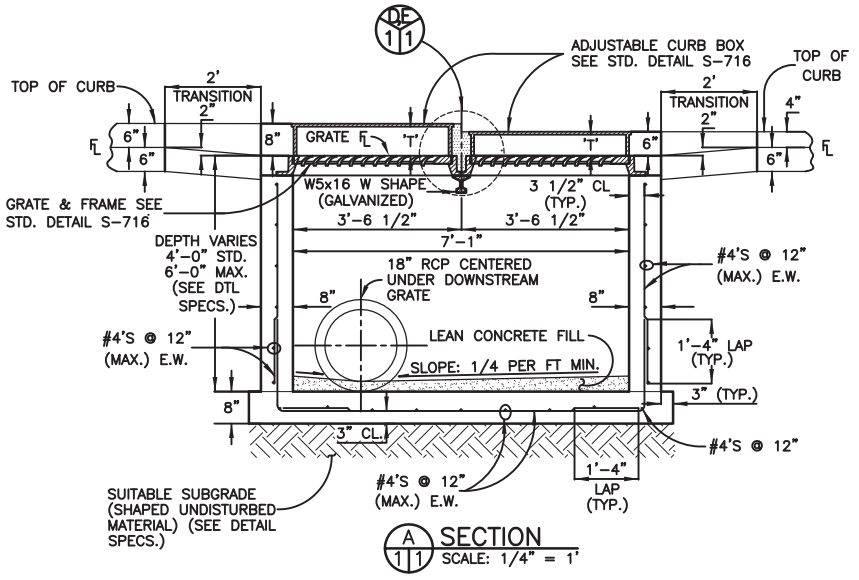


6" VERTICAL CURB & GUTTER

COMB. CURB GUTTER & SIDEWALK

PLAN
SCALE: 1/4" = 1'

'T' = THROAT OPENING
'T' = 6" FOR 6" VERTICAL CURB & GUTTER
'T' = 5" FOR COMBINATION CURB GUTTER & SIDEWALK
DROP FROM GUTTER ℄ ELEVATION TO GRATE ℄ ELEVATION (TRANSITION) IS 2".



A 1 1 SECTION
SCALE: 1/4" = 1'

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.2

COMBINATION INLET TYPE 13/ DENVER TYPE 16 - DOUBLE NO. 16 OPEN THROAT INLET ADJUSTABLE CURB BOX

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

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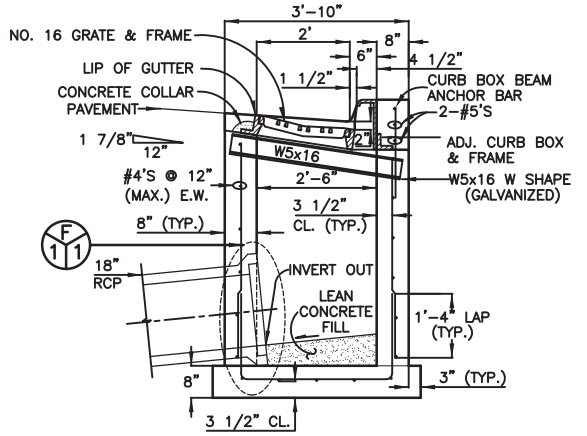
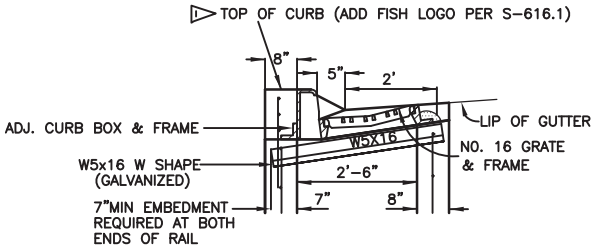
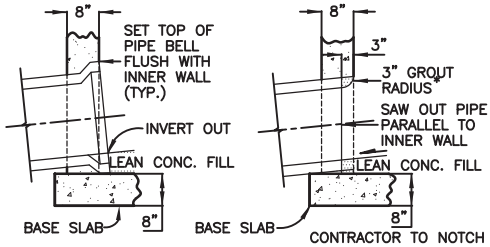
Drawing No.
SP.39a



VERT. CURB
B 1 1 SECTION & GUTTER
SCALE: 1/4" = 1'

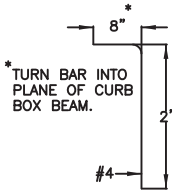


COMB CURB
C 1 1 SECTION GUTTER & SIDEWALK
SCALE: 1/4" = 1'

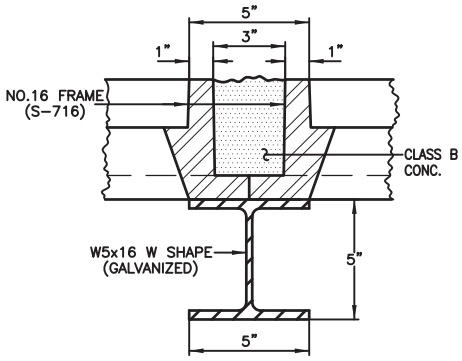


PREFERRED **OPTIONAL**

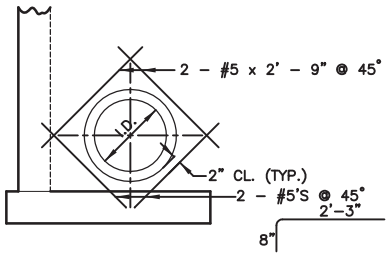
CONNECTOR PIPE
F 1 1 DETAIL END TREATMENT (TYP.)
SCALE: 1/4" = 1'



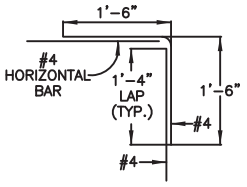
CURB BOX BEAM
DETAIL ANCHOR BAR (TYP.)
SCALE: 3/8" = 1'



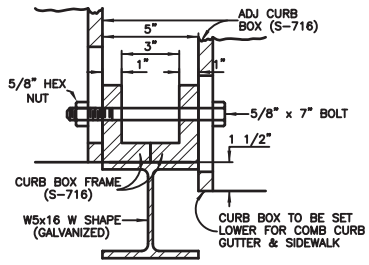
FRAME PLACEMENT
E 1 1 DETAIL ON SUPPORT RAIL (TYP.)
SCALE: 1 1/2" = 1'



REBAR PLACEMENT
DETAIL INLET WALL PENETRATION
SCALE: 1/4" = 1'



TYPICAL CORNER
DETAIL REBAR PLACEMENT
SCALE: 3/8" = 1'



PLACEMENT OF ADJ. CURB
D 1 1 DETAIL BOX ON SUPPORT RAIL (TYP.)
SCALE: 1 1/2" = 1'

GENERAL NOTES

1. CONCRETE SHALL BE CLASS D. INLET SHALL BE CAST-IN-PLACE.
2. CAST-IN-PLACE CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES.
3. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
4. STEPS SHALL BE PROVIDED WHEN INLET DEPTH EXCEEDS 3'-6" AND SHALL BE IN ACCORDANCE WITH AASHTO M 199.
5. ALL GRATES AND FRAMES SHALL BE GRAY OR DUCTILE CAST IRON CONFORMING TO CDOT STANDARD SPECIFICATIONS, SUSECTION 712.06. GRATES AND FRAMES SHALL BE DESIGNED TO WITHSTAND HS 20 LOADING.
6. FLOOR SLOPE MAY BE POURED MONOLITHIC WITH BASE.
7. UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS OR OTHERWISE APPROVED, ALL #16 INLETS SHALL BE CONSTRUCTED WITH AN ADJUSTABLE C.I. CURB BOX (STANDARD DETAIL SD-9).
8. DESIGN CONDITIONS FOR INLET ALLOWS DEPTHS OF 6' (MAX.). FOR INLETS MORE THAN 6' IN DEPTH, SHOP DRAWINGS AND DESIGN ANALYSIS SHALL BE SUBMITTED FOR APPROVAL.
9. ALL REINFORCING STEEL SHALL BE ASTM, A-615, GRADE 60 DEFORMED BARS. DIAMETER OF BEND MEASURED ON THE INSIDE OF THE BAR SHALL BE A MINIMUM OF 6 BAR DIAMETER. REINFORCING BARS SHALL HAVE A 2" MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
10. ALL WORK SHALL CONFORM TO THE DOUGLAS COUNTY ROADWAY DESIGN AND CONSTRUCTION STANDARDS MANUAL, LATEST EDITION.
11. SUB-GRADE SHALL BE SHAPED UNDISTURBED MATERIAL OR OVEREXCAVATED AND BACKFILLED WITH CLASS B BEDDING MATERIAL.
12. NO FORMWORK SHALL REMAIN INSIDE STRUCTURE WHEN COMPLETE.
13. SPLICING OF REINFORCING STEEL SHALL BE PERMITTED ONLY WHERE DETAILED IN DRAWINGS.
14. INLET WALLS SHALL BE FORMED BOTH INSIDE AND OUTSIDE. CASTING OF SIDEWALLS AGAINST EARTH IS NOT PERMITTED.
15. LEAN CONCRETE FILL TO BE CLASS B.
16. THIS INLET IS NOT FOR USE IN COUNTY R.O.W.

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.2

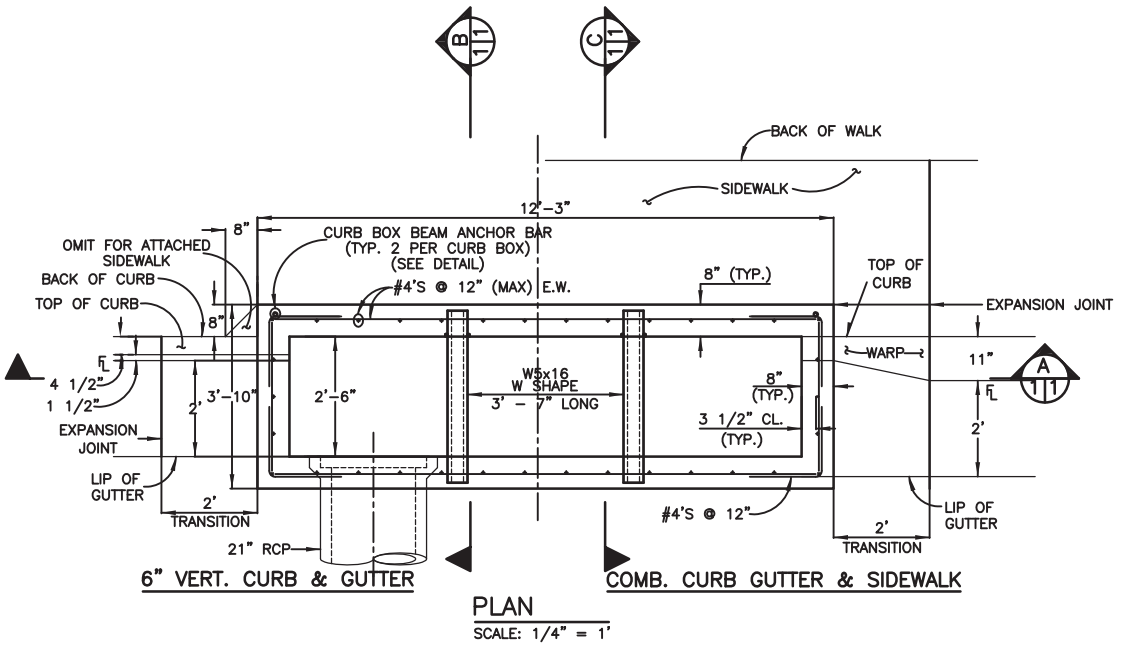
COMBINATION INLET TYPE 13/ DENVER TYPE 16 - DOUBLE NO. 16 OPEN THROAT INLET ADJUSTABLE CURB BOX

DOUGLAS COUNTY
COLORADO

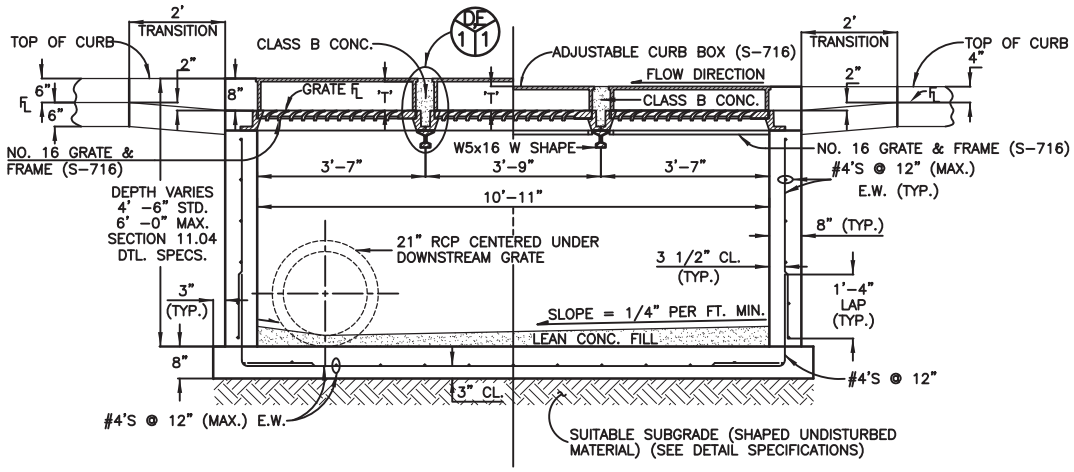
Issued: 05/2013

Revised:

Drawing No.
SP.39b



'T' = THROAT OPENING
'T' = 6" FOR VERTICAL CURB & GUTTER
'T' = 5" FOR COMBINATION CURB GUTTER & SIDEWALK
DROP FROM GUTTER ℄ ELEVATION TO GRATE ℄ ELEVATION (TRANSITION) IS 2".



A 1/1 SECTION
SCALE: 1/4" = 1'

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.3

COMBINATION INLET TYPE 13/ DENVER TYPE 16 - TRIPLE NO. 16 OPEN THROAT INLET ADJUSTABLE CURB BOX

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

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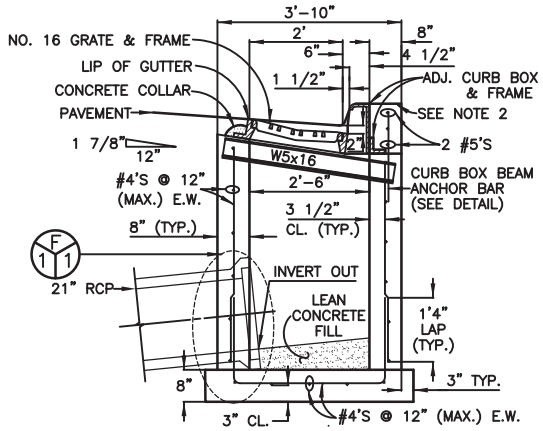
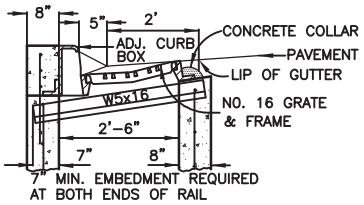
Drawing No.
SP.40a



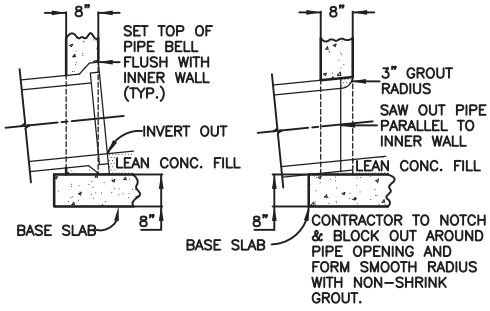
B 1 1 SECTION VERTICAL
SCALE: NOT TO SCALE



C 1 1 SECTION COMBINATION
SCALE: 1/4" = 1'

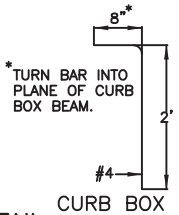
GENERAL NOTES

1. CONCRETE SHALL BE CLASS D. INLET SHALL BE CAST-IN-PLACE.
2. CAST-IN-PLACE CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES.
3. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
4. STEPS SHALL BE PROVIDED WHEN INLET DEPTH EXCEEDS 3'-6" AND SHALL BE IN ACCORDANCE WITH AASHTO M 199.
5. ALL GRATES AND FRAMES SHALL BE GRAY OR DUCTILE CAST IRON CONFORMING TO CDOT STANDARD SPECIFICATIONS, SUSECTION 712.06. GRATES AND FRAMES SHALL BE DESIGNED TO WITHSTAND HS 20 LOADING.
6. FLOOR SLOPE MAY BE POURED MONOLITHIC WITH BASE.
7. UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS OR OTHERWISE APPROVED, ALL #16 INLETS SHALL BE CONSTRUCTED WITH AN ADJUSTABLE C.I. CURB BOX (STANDARD DETAIL SD-9).
8. DESIGN CONDITIONS FOR INLET ALLOWS DEPTHS OF 6' (MAX.). FOR INLETS MORE THAN 6' IN DEPTH, SHOP DRAWINGS AND DESIGN ANALYSIS SHALL BE SUBMITTED FOR APPROVAL.
9. ALL REINFORCING STEEL SHALL BE ASTM, A-615, GRADE 60 DEFORMED BARS. DIAMETER OF BEND MEASURED ON THE INSIDE OF THE BAR SHALL BE A MINIMUM OF 6 BAR DIAMETER. REINFORCING BARS SHALL HAVE A 2" MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
10. ALL WORK SHALL CONFORM TO THE DOUGLAS COUNTY ROADWAY DESIGN AND CONSTRUCTION STANDARDS MANUAL, LATEST EDITION.
11. SUB-GRADE SHALL BE SHAPED UNDISTURBED MATERIAL OR OVEREXCAVATED AND BACKFILLED WITH CLASS B BEDDING MATERIAL.
12. NO FORMWORK SHALL REMAIN INSIDE STRUCTURE WHEN COMPLETE.
13. SPLICING OF REINFORCING STEEL SHALL BE PERMITTED ONLY WHERE DETAILED IN DRAWINGS.
14. INLET WALLS SHALL BE FORMED BOTH INSIDE AND OUTSIDE. CASTING OF SIDEWALLS AGAINST EARTH IS NOT PERMITTED.
15. LEAN CONCRETE FILL TO BE CLASS B.
16. THIS INLET IS NOT FOR USE IN COUNTY R.O.W.
17. TOP OF CURB (ADD FISH LOGO PER SD-5), CENTER GRATE.

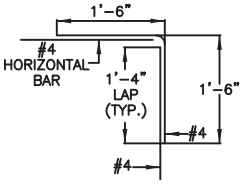


PREFERRED OPTIONAL

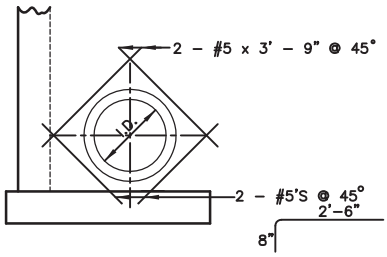
F 1 1 DETAIL CONNECTOR PIPE END TREATMENT
SCALE: 1/4" = 1'



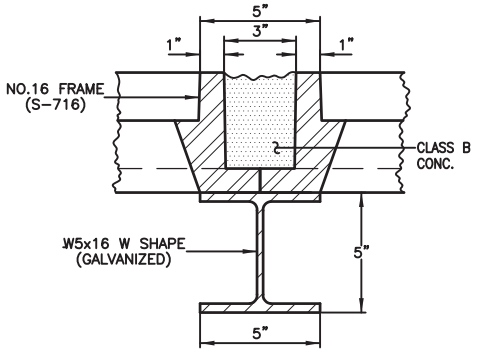
CURB BOX BEAM DETAIL ANCHOR BAR (TYP.)
SCALE: 3/8" = 1'



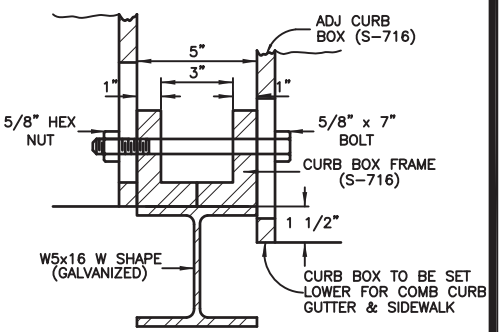
TYPICAL CORNER DETAIL REBAR PLACEMENT
SCALE: 3/8" = 1'



REBAR PLACEMENT DETAIL INLET WALL PENETRATION (TYP.)
SCALE: 1/4" = 1'



F 1 1 FRAME PLACEMENT DETAIL ON SUPPORT RAIL
SCALE: 1 1/2" = 1'



D 1 1 CURB BOX PLACEMENT DETAIL ON SUPPORT RAIL
SCALE: 1 1/2" = 1'

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616.3

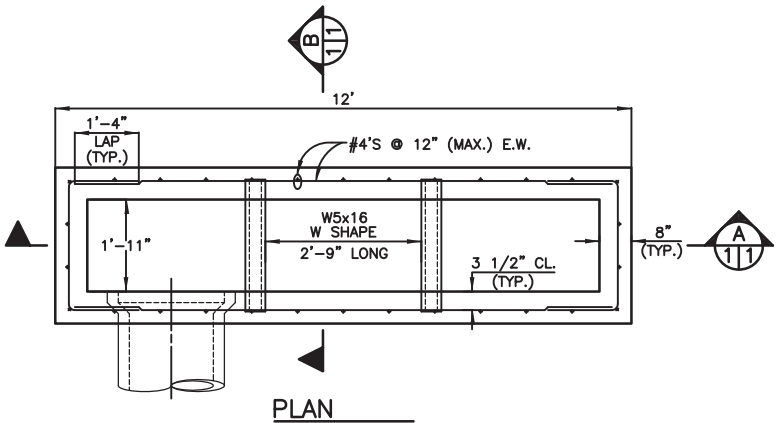
COMBINATION INLET TYPE 13/ DENVER TYPE 16 - TRIPLE NO. 16 OPEN THROAT INLET ADJUSTABLE CURB BOX

DOUGLAS COUNTY
COLORADO

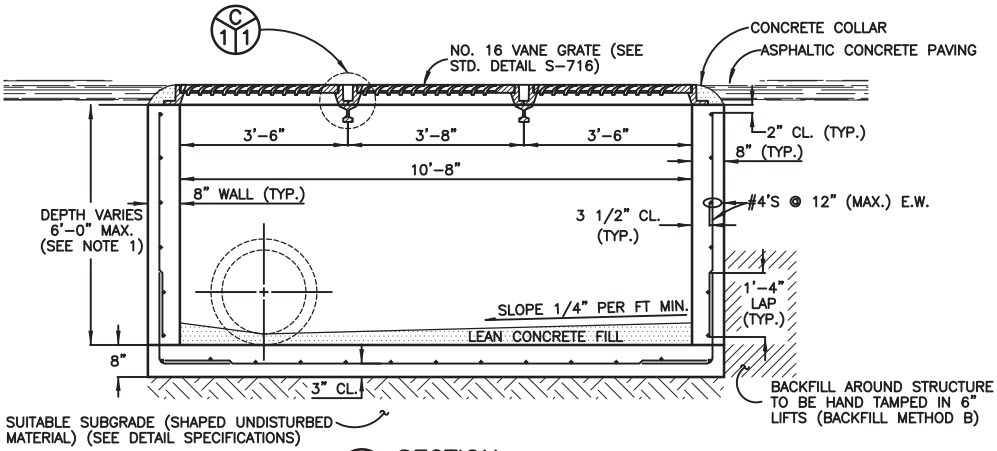
Issued: 05/2013

Revised:

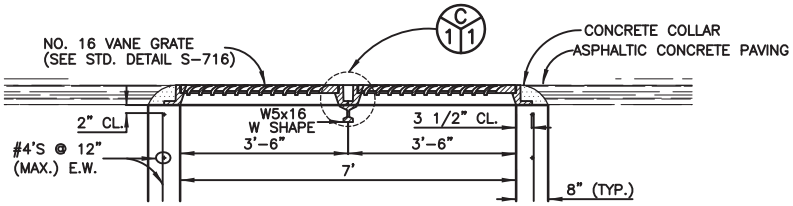
Drawing No.
SP.40b



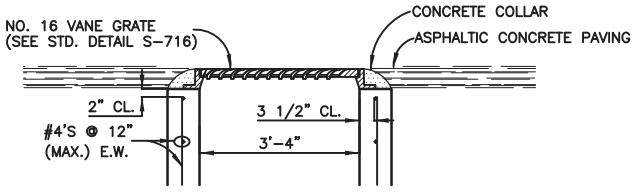
PLAN
SCALE: 1/4" = 1'



A 1 1 SECTION
SCALE: 1/4" = 1'



DOUBLE NO. 16 INLET
SCALE: 1/4" = 1'



SINGLE NO. 16 INLET
SCALE: 1/4" = 1'

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616V

COMBINATION INLET TYPE 13/ DENVER TYPE 16 - SINGLE, DOUBLE & TRIPLE NO. 16 INLET VALLEY

DOUGLAS COUNTY
COLORADO

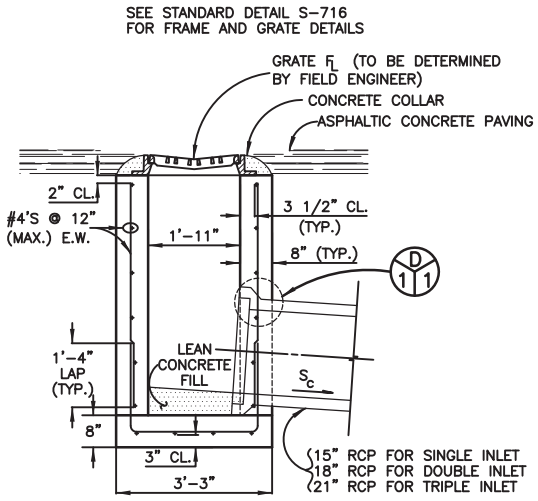
Issued: 05/2013

Revised:

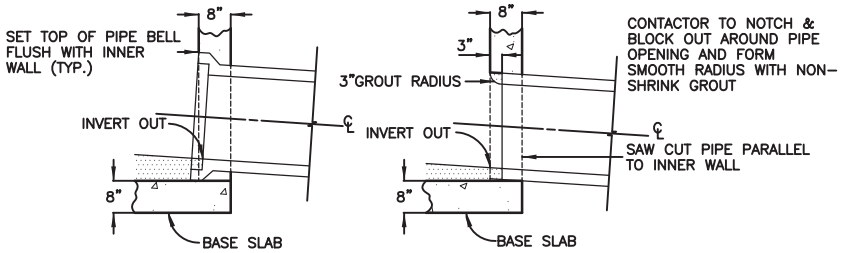
Drawing No.
SP.41a

GENERAL NOTES

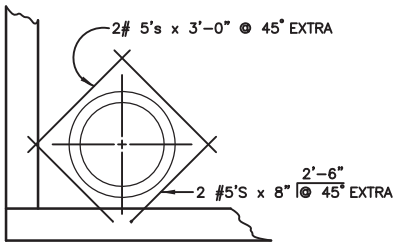
1. CONCRETE SHALL BE CLASS D. INLET SHALL BE CAST-IN-PLACE.
2. CAST-IN-PLACE CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES.
3. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
4. STEPS SHALL BE PROVIDED WHEN INLET DEPTH EXCEEDS 3'-6" AND SHALL BE IN ACCORDANCE WITH AASHTO M 199.
5. ALL GRATES AND FRAMES SHALL BE GRAY OR DUCTILE CAST IRON CONFORMING TO CDOT STANDARD SPECIFICATIONS, SUSECTION 712.06. GRATES AND FRAMES SHALL BE DESIGNED TO WITHSTAND HS 20 LOADING.
6. FLOOR SLOPE MAY BE POURED MONOLITHIC WITH BASE.
7. UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS OR OTHERWISE APPROVED, ALL #16 INLETS SHALL BE CONSTRUCTED WITH AN ADJUSTABLE C.I. CURB BOX (STANDARD DETAIL SD-9).
8. DESIGN CONDITIONS FOR INLET ALLOWS DEPTHS OF 6' (MAX.). FOR INLETS MORE THAN 6' IN DEPTH, SHOP DRAWINGS AND DESIGN ANALYSIS SHALL BE SUBMITTED FOR APPROVAL.
9. ALL REINFORCING STEEL SHALL BE ASTM, A-615, GRADE 60 DEFORMED BARS. DIAMETER OF BEND MEASURED ON THE INSIDE OF THE BAR SHALL BE A MINIMUM OF 6 BAR DIAMETER. REINFORCING BARS SHALL HAVE A 2" MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
10. ALL WORK SHALL CONFORM TO THE DOUGLAS COUNTY ROADWAY DESIGN AND CONSTRUCTION STANDARDS MANUAL, LATEST EDITION.
11. SUB-GRADE SHALL BE SHAPED UNDISTURBED MATERIAL OR OVEREXCAVATED AND BACKFILLED WITH CLASS B BEDDING MATERIAL.
12. NO FORMWORK SHALL REMAIN INSIDE STRUCTURE WHEN COMPLETE.
13. SPLICING OF REINFORCING STEEL SHALL BE PERMITTED ONLY WHERE DETAILED IN DRAWINGS.
14. INLET WALLS SHALL BE FORMED BOTH INSIDE AND OUTSIDE. CASTING OF SIDEWALLS AGAINST EARTH IS NOT PERMITTED.
15. LEAN CONCRETE FILL TO BE CLASS B.
16. THIS INLET IS NOT FOR USE IN COUNTY R.O.W.



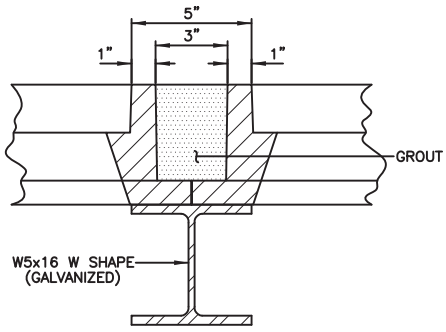
B 1 1 SECTION
SCALE: 1/4" = 1'



D 1 1 CONNECTOR PIPE DETAIL END TREATMENT
SCALE: 1/4" = 1'



CONNECTOR PIPE
DETAIL END TREATMENT (TYP.)
SCALE: 1/4" = 1'



C 1 1 FRAME PLACEMENT DETAIL ON SUPPORT RAIL (TYP.)
SCALE: 1 1/2" = 1'

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-616V

COMBINATION INLET TYPE 13/ DENVER TYPE 16 - SINGLE, DOUBLE & TRIPLE NO. 16 INLET VALLEY

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

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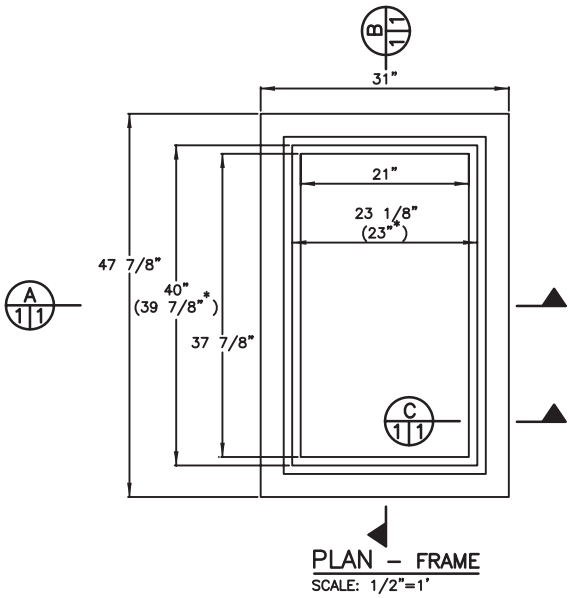
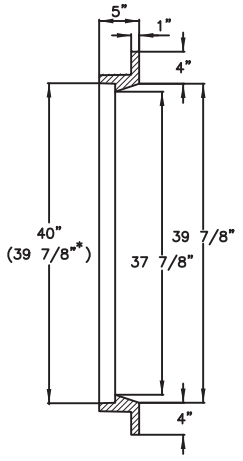
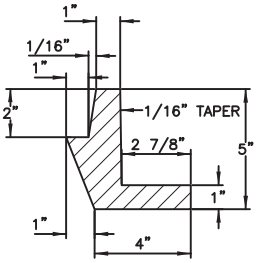
Drawing No.
SP.41b



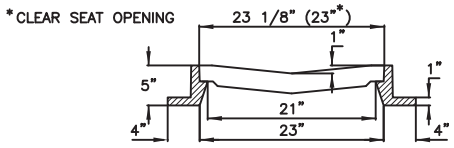
PLAN – FRAME
SCALE: 1/2"=1'



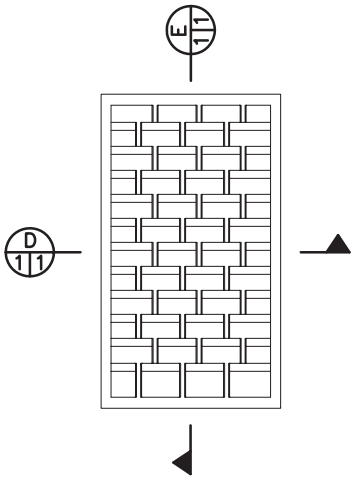
B 1 1 SECTION
SCALE: 1/2"=1'



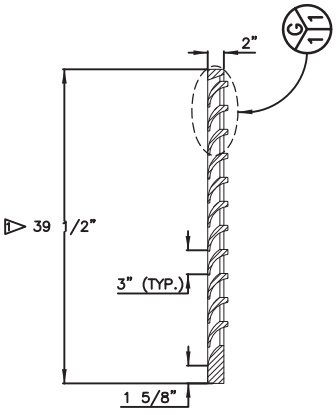
C 1 1 DETAIL
SCALE: 1 1/2"=1'



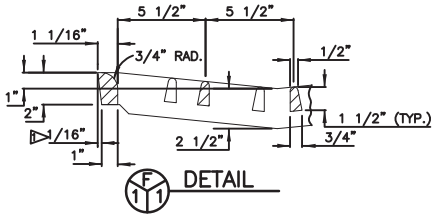
A 1 1 SECTION
SCALE: 1/2"=1'



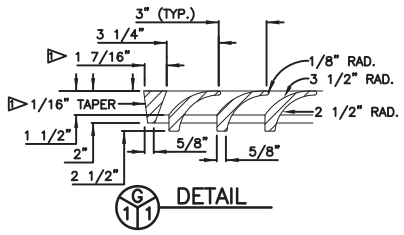
PLAN – GRATE
SCALE: 1/2"=1'



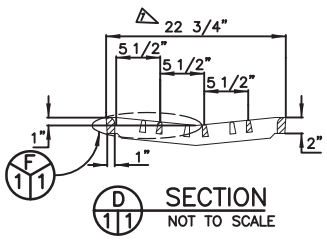
E 1 1 SECTION
NOT TO SCALE



F 1 1 DETAIL



G 1 1 DETAIL



D 1 1 SECTION
NOT TO SCALE

FIG. 1 NO. 16 INLET GRATE & FRAME

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-716

COMBINATION INLET TYPE 13/ DENVER TYPE 16 - NO. 16 INLET GRATE & FRAME AND ADJUSTABLE CURB BOX

DOUGLAS COUNTY
COLORADO

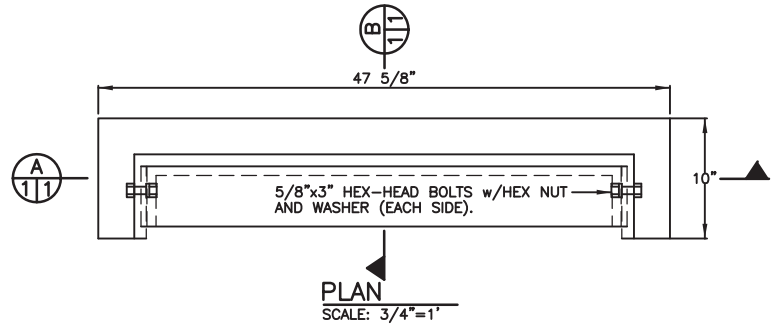
Issued: 05/2013

Revised: _____

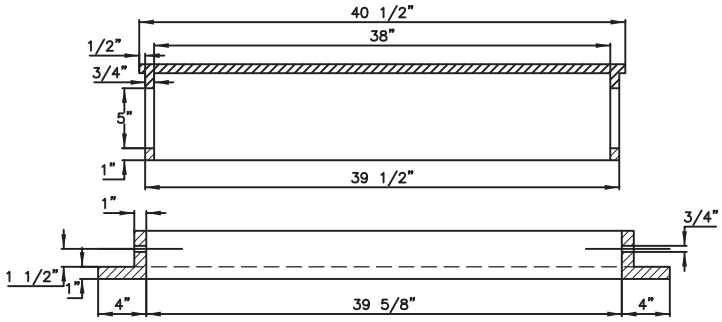
Drawing No.
SP.42a

GENERAL NOTES

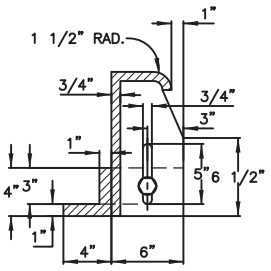
1. CONCRETE SHALL BE CLASS D. INLET SHALL BE CAST-IN-PLACE.
2. CAST-IN-PLACE CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES.
3. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
4. STEPS SHALL BE PROVIDED WHEN INLET DEPTH EXCEEDS 3'-6" AND SHALL BE IN ACCORDANCE WITH AASHTO M 199.
5. ALL GRATES AND FRAMES SHALL BE GRAY OR DUCTILE CAST IRON CONFORMING TO CDOT STANDARD SPECIFICATIONS, SUSECTION 712.06. GRATES AND FRAMES SHALL BE DESIGNED TO WITHSTAND HS 20 LOADING.
6. FLOOR SLOPE MAY BE POURED MONOLITHIC WITH BASE.
7. UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS OR OTHERWISE APPROVED, ALL #16 INLETS SHALL BE CONSTRUCTED WITH AN ADJUSTABLE C.I. CURB BOX (STANDARD DETAIL SD-9).
8. DESIGN CONDITIONS FOR INLET ALLOWS DEPTHS OF 6' (MAX.). FOR INLETS MORE THAN 6' IN DEPTH, SHOP DRAWINGS AND DESIGN ANALYSIS SHALL BE SUBMITTED FOR APPROVAL.
9. ALL REINFORCING STEEL SHALL BE ASTM, A-615, GRADE 60 DEFORMED BARS. DIAMETER OF BEND MEASURED ON THE INSIDE OF THE BAR SHALL BE A MINIMUM OF 6 BAR DIAMETER. REINFORCING BARS SHALL HAVE A 2" MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
10. ALL WORK SHALL CONFORM TO THE DOUGLAS COUNTY ROADWAY DESIGN AND CONSTRUCTION STANDARDS MANUAL, LATEST EDITION.
11. SUB-GRADE SHALL BE SHAPED UNDISTURBED MATERIAL OR OVEREXCAVATED AND BACKFILLED WITH CLASS B BEDDING MATERIAL.
12. NO FORMWORK SHALL REMAIN INSIDE STRUCTURE WHEN COMPLETE.
13. SPLICING OF REINFORCING STEEL SHALL BE PERMITTED ONLY WHERE DETAILED IN DRAWINGS.
14. INLET WALLS SHALL BE FORMED BOTH INSIDE AND OUTSIDE. CASTING OF SIDEWALLS AGAINST EARTH IS NOT PERMITTED.
15. LEAN CONCRETE FILL TO BE CLASS B.
16. THIS INLET IS NOT FOR USE IN COUNTY R.O.W.
17. ALL GRATES AND FRAMES SHALL BE GRAY OR DUCTILE CAST IRON CONFORMING TO CDOT STANDARD SPECIFICATIONS, SUbSECTION 712.06. GRATES AND FRAMES SHALL BE DESIGNED TO WITHSTAND HS 20 LOADING.



PLAN
SCALE: 3/4"=1'



A 1 1 SECTION
SCALE: 3/4"=1'



B 1 1 SECTION
SCALE: 3/4"=1'

FIG. 2 ADJUSTABLE CURB BOX
MINIMUM CURB OPENING AREA = 150in^2

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-716

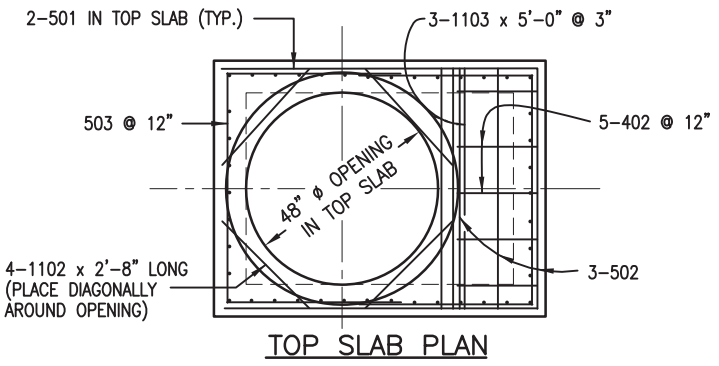
COMBINATION INLET TYPE 13/ DENVER TYPE 16 - NO. 16 INLET GRATE & FRAME AND ADJUSTABLE CURB BOX

DOUGLAS COUNTY
COLORADO

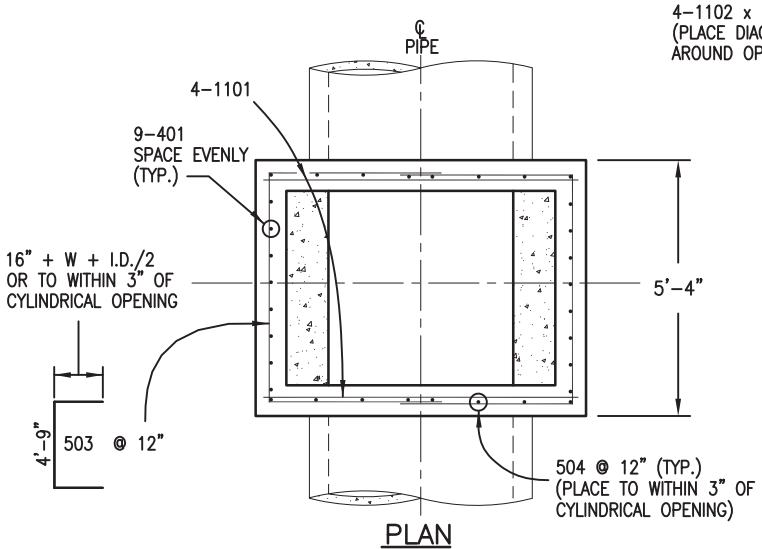
Issued: 05/2013

Revised:

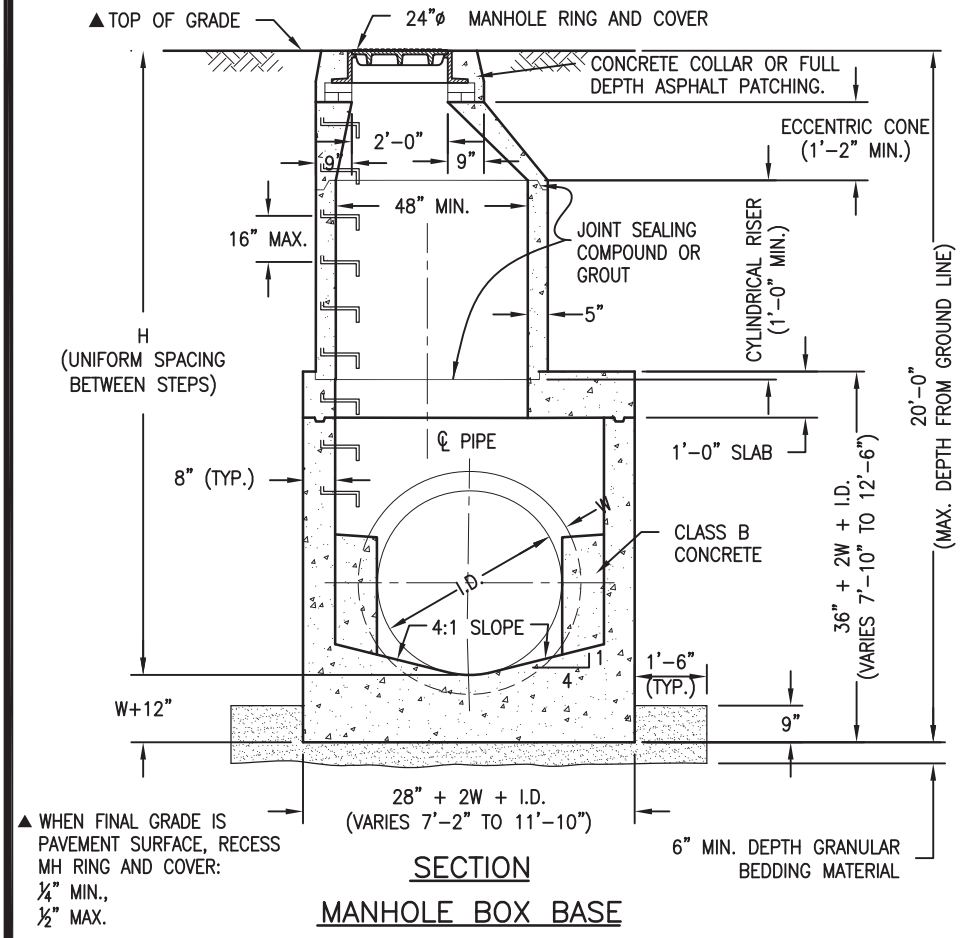
Drawing No.
SP.42b



TOP SLAB PLAN



PLAN



▲ WHEN FINAL GRADE IS PAVEMENT SURFACE, RECESS MH RING AND COVER: ¼" MIN., ½" MAX.

SECTION

MANHOLE BOX BASE

REFERENCE:

CDOT M & S STANDARDS
M-604-20

MANHOLES

DOUGLAS COUNTY
COLORADO

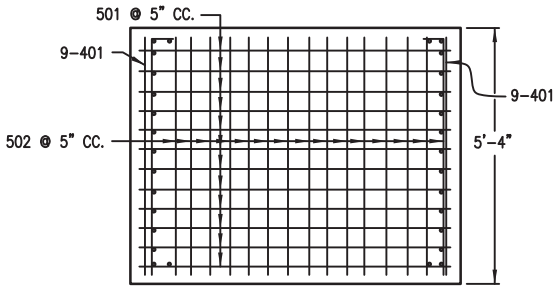
Issued: 05/2013

Revised: _____

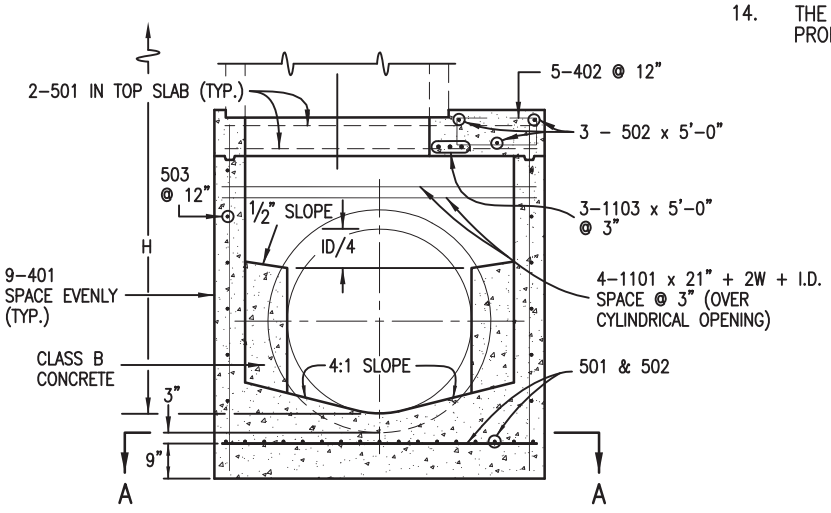
Drawing No.
SP.43a

GENERAL NOTES

1. SINCE ALL PIPE ENTRIES INTO THE BASE ARE VARIABLE, THE DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS AND QUANTITIES FOR CONCRETE AND REINFORCEMENT SHALL BE AS REQUIRED IN THE WORK.
2. THE PRECAST FLAT TOP MAY BE USED ON ANY MANHOLE. THE ECCENTRIC CONE MAY BE USED WHEN THE MANHOLE "H" HEIGHT IS AT LEAST 8'.
3. THE MH RING (FRAME) SHALL BE SET ON CONCRETE GRADE RINGS. THE FRAME SHALL BE SURROUNDED WITH A CONCRETE COLLAR IN UNPAVED AREA AND CONCRETE PAVEMENT, OR FULL DEPTH ASPHALT IN ASPHALT PAVEMENT. SEE DETAILS ON SHEETS 2 AND 3.
4. DESIGN OF BOX BASE IS BASED ON STRAIGHT RUNS OF CONDUIT OR CHANGE IN DIRECTION OF LESS THAN 45°. SPECIAL DESIGN IS REQUIRED FOR 45° OR GREATER.
5. PRECAST MANHOLES AND REINFORCEMENT SHALL CONFORM TO ASTM C 478 (AASHTO M 199).
6. CAST-IN-PLACE MANHOLES SHALL BE CLASS D CONCRETE.
7. STEPS SHALL BE REQUIRED WHEN THE MANHOLE DEPTH EXCEEDS 3'-6" AND SHALL BE IN ACCORDANCE WITH AASHTO M 199.
8. ALL REINFORCING STEEL SHALL HAVE A MINIMUM YIELD STRENGTH OF 60,000 PSI. VERTICAL STEEL SHALL BE PLACED AT ℄ OF WALL. ALL BARS SHALL HAVE A 2" MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
9. IF ANY REBAR HAS TO BE CUT ON THE JOB SITE, THE EXPOSED BARE STEEL SHALL BE IMMEDIATELY COVERED WITH A MANUFACTURE APPROVED EPOXY PAINT PRIOR TO POUR.
10. ALL PIPE ENTRIES INTO THE BASE OF MANHOLE SHALL BE CONNECTED BY OPEN CHANNELIZATION ADJUSTED FOR PIPE SIZE, SHAPE, SLOPE, AND DIRECTION OF FLOW. DETAILS SHOWN ARE TYPICAL FOR INSTALLATIONS WITH ALL INVERTS OF SAME RELATIVE ELEVATION. FOR EXCESSIVE ELEVATION DIFFERENCE BETWEEN INVERTS, SPECIAL BASE/CHANNEL DETAILS WILL BE SHOWN ON THE PLANS.
11. FLOW CHANNELS AND INVERTS SHALL BE FORMED BY SHAPING WITH CLASS B CONCRETE.
12. STUB-OUTS SHALL EXTEND A MINIMUM OF 1 PIPE SECTION BEYOND OUTSIDE WALL SURFACE OF MANHOLE AND BE SATISFACTORILY PLUGGED.
13. CHECK WITH THE LOCAL GOVERNMENT AUTHORITY FOR ANY ADDITIONAL SANITARY SEWER SPECIFICATIONS, DETAILS, OR REGULATIONS.
14. THE SLOPE OF THE MANHOLE COVER SHALL MATCH THE ROADWAY PROFILE AND CROSS SLOPE.



SECTION A-A
(STEEL IN BOTTOM OF BASE)



SECTION

REFERENCE:

CDOT M & S STANDARDS
M-604-20

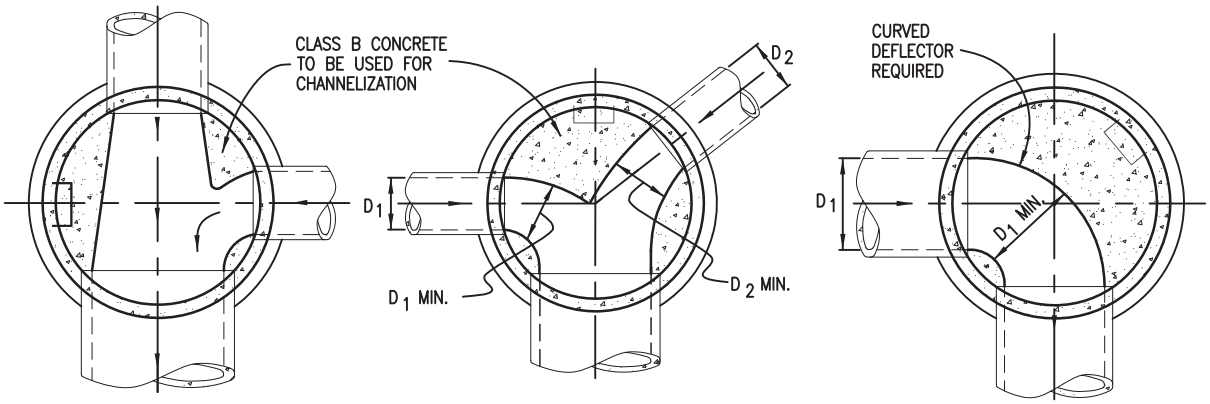
MANHOLES

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised: _____

Drawing No.
SP.43b



THROUGH PIPE ONE LATERAL

ANGLED LATERALS

SHARP ANGLE

TYPICAL CHANNELIZATION DETAILS

QUANTITIES FOR CONCRETE MANHOLE BOX BASE

MARK	SIZE	TYPE	WT. #/FT.	BARS	I.D. 60"	I.D. 66"	I.D. 72"	I.D. 84"	I.D. 96"	FORMULAS
401	4	I	0.668	NO. REQ'D.	18	18	18	18	18	401
				LENGTH	8'-8"	9'-3"	9'-10"	11'-0"	12'-2"	BAR LENGTH = 32"+2W+I.D.
				WEIGHT #	104.2	111.2	118.2	132.3	146.3	
402	4	III	0.668	NO. REQ'D.	5	5	5	5	5	402
				LENGTH	6'-0"	6'-7"	7'-2"	8'-4"	9'-6"	BAR LENGTH = I.D. + 2W
				WEIGHT #	20.0	22.0	23.9	27.8	31.7	
501	5	I	1.043	NO. REQ'D.	17	17	17	17	17	501
				LENGTH	8'-0"	8'-7"	9'-2"	10'-4"	11'-6"	BAR LENGTH = 24" + I.D. + 2W
				WEIGHT #	141.8	152.2	162.5	183.2	203.9	
502	5	I	1.043	NO. REQ'D.	23	25	26	29	32	502
				LENGTH	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	NUMBER BARS REQ'D. = $3 + \left(\frac{24+I.D.+2W}{@\ 5"}+1\right)$
				WEIGHT #	119.9	130.4	135.6	151.2	166.9	
503	5	II	1.043	NO. REQ'D.	16	18	18	20	24	503
				LENGTH	13'-5"	14'-0"	14'-7"	15'-9"	16'-11"	NUMBER BARS REQ'D. = $2\left(\frac{13+I.D.+2W}{@\ 12"}+1\right)$
				WEIGHT #	223.9	262.8	273.8	328.5	423.5	BAR LENGTH = 4'-9"+2(16+W+I.D./2)
504	5	I	1.043	NO. REQ'D.	14	14	16	18	20	504
				LENGTH	8'-8"	9'-3"	9'-10"	11'-0"	12'-2"	NUMBER BARS REQ'D. = $2\left(\frac{2W+I.D.-4}{@\ 12"}+1\right)$
				WEIGHT #	126.6	135.1	164.1	206.5	253.8	BAR LENGTH = 32"+2W+I.D.
1101	11	I	5.313	NO. REQ'D.	4	4	4	4	4	1101
				LENGTH	7'-9"	8'-4"	8'-11"	10'-1"	11'-3"	BAR LENGTH = 21" + I.D. + 2W
				WEIGHT #	164.7	177.1	189.5	214.3	239.1	
1102	11	I	5.313	NO. REQ'D.	4	4	4	4	4	BENDING
				LENGTH	2'-8"	2'-8"	2'-8"	2'-8"	56.7	TYPE I — STRAIGHT
				WEIGHT #	56.7	56.7	56.7	56.7	2'-8"	
1103	11	I	5.313	NO. REQ'D.	3	3	3	3	3	TYPE II — 4'-9", 16"+W+I.D./2
				LENGTH	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	
				WEIGHT #	79.7	79.7	79.7	79.7	79.7	TYPE III — 12", 12", 7", I.D.+2W-38"
REINFORCING STEEL TOTAL #					1,037.5	1,127.2	1,204.0	1,380.2	1,601.6	
CONCRETE – CUBIC YARDS – TOTAL					6.6	7.3	8.0	9.5	11.1	

NOTE: QUANTITIES ARE BASED ON SAME SIZE PIPE ENTRANCE TO AND EXIT FROM, BASE AND A 4 FT. MANHOLE ENTRANCE INTO TOP SLAB OF BASE.

REFERENCE:

CDOT M & S STANDARDS
M-604-20

MANHOLES

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

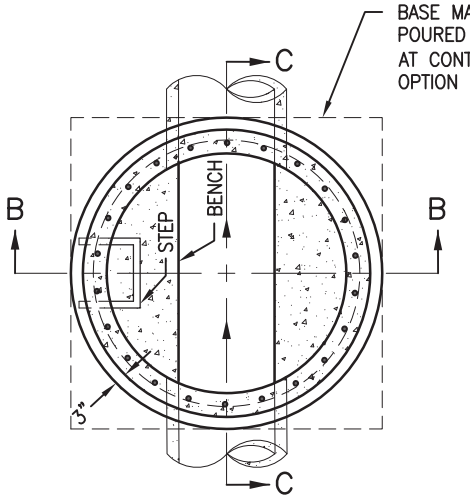
Drawing No.
SP.43c

LEGEND

SUITABLE SUBGRADE

GRANULAR BEDDING MATERIAL

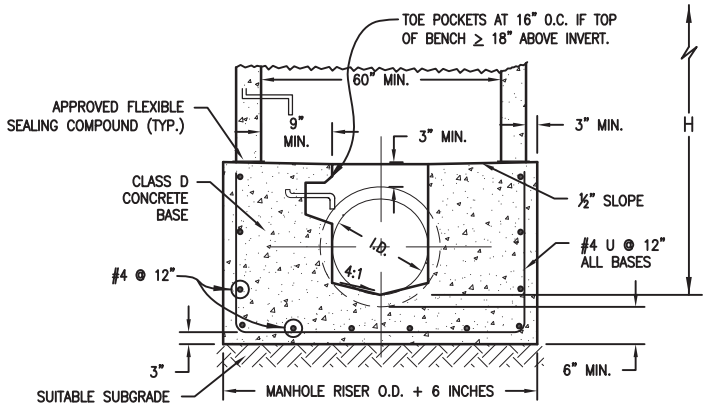
CONCRETE



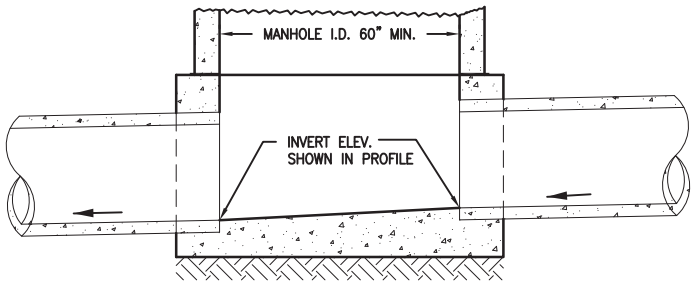
PLAN

MANHOLE BASES:

1. THE BASE SLAB SHALL BE POURED MONOLITHICALLY WITH BOTTOM RISER SECTION.
2. MANHOLE BASES SHALL FIT THE CONDITIONS AND LOCATIONS FOR WHICH THEY ARE INTENDED WITHOUT ANY FIELD MODIFICATIONS. ANY MANHOLE BASE WHICH REQUIRES FIELD CUTTING OR MODIFICATION IN ORDER TO FIT THE LOCATIONS INTENDED WILL BE REJECTED BY THE ENGINEER AND REMOVED AND REPLACED BY THE CONTRACTOR AT NO COST TO THE DEPARTMENT.
3. MANHOLE BASES SHALL BE BEDDED ON AN APPROVED GRANULAR BEDDING MATERIAL AS SHOWN ABOVE.



SECTION B–B



SECTION C–C

CAST–IN–PLACE
SLAB BASE

REFERENCE:

CDOT M & S STANDARDS
M-604-20

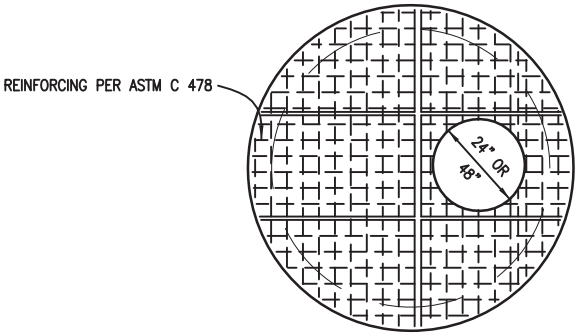
MANHOLES

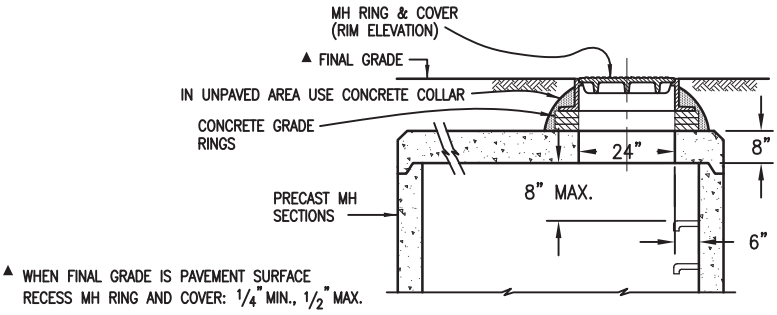
DOUGLAS COUNTY
COLORADO

Issued: 05/2013

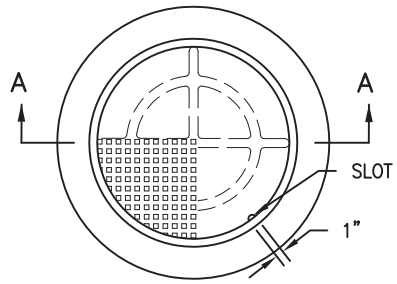
Revised:

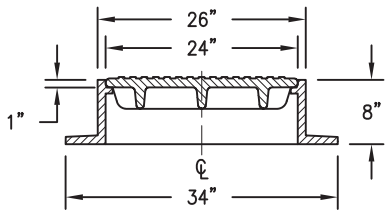
Drawing No.
SP.43d





FLAT TOP SECTION DETAIL

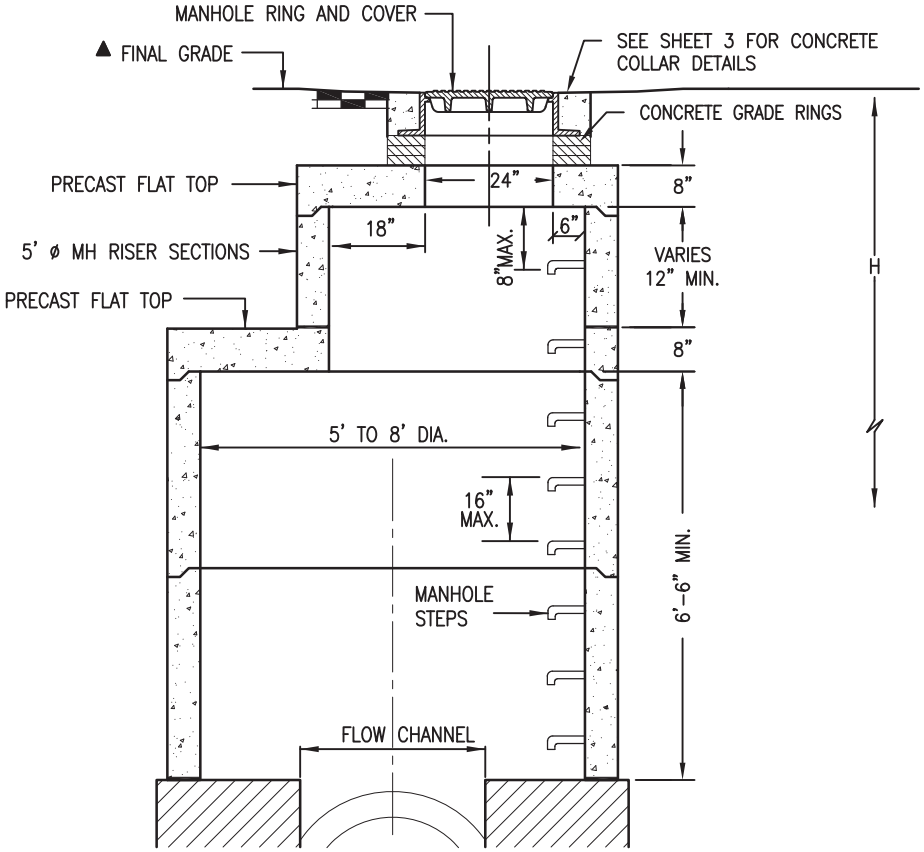




TOTAL WEIGHT: APPROXIMATELY 400 LBS. SHALL BE GRAY OR DUCTILE CAST IRON CONFORMING TO CDOT STANDARD SPECIFICATIONS, SUBSECTION 712.06.

SECTION A–A

MANHOLE RING AND COVER



REFERENCE:

CDOT M & S STANDARDS
M-604-20

MANHOLES

DOUGLAS COUNTY
COLORADO

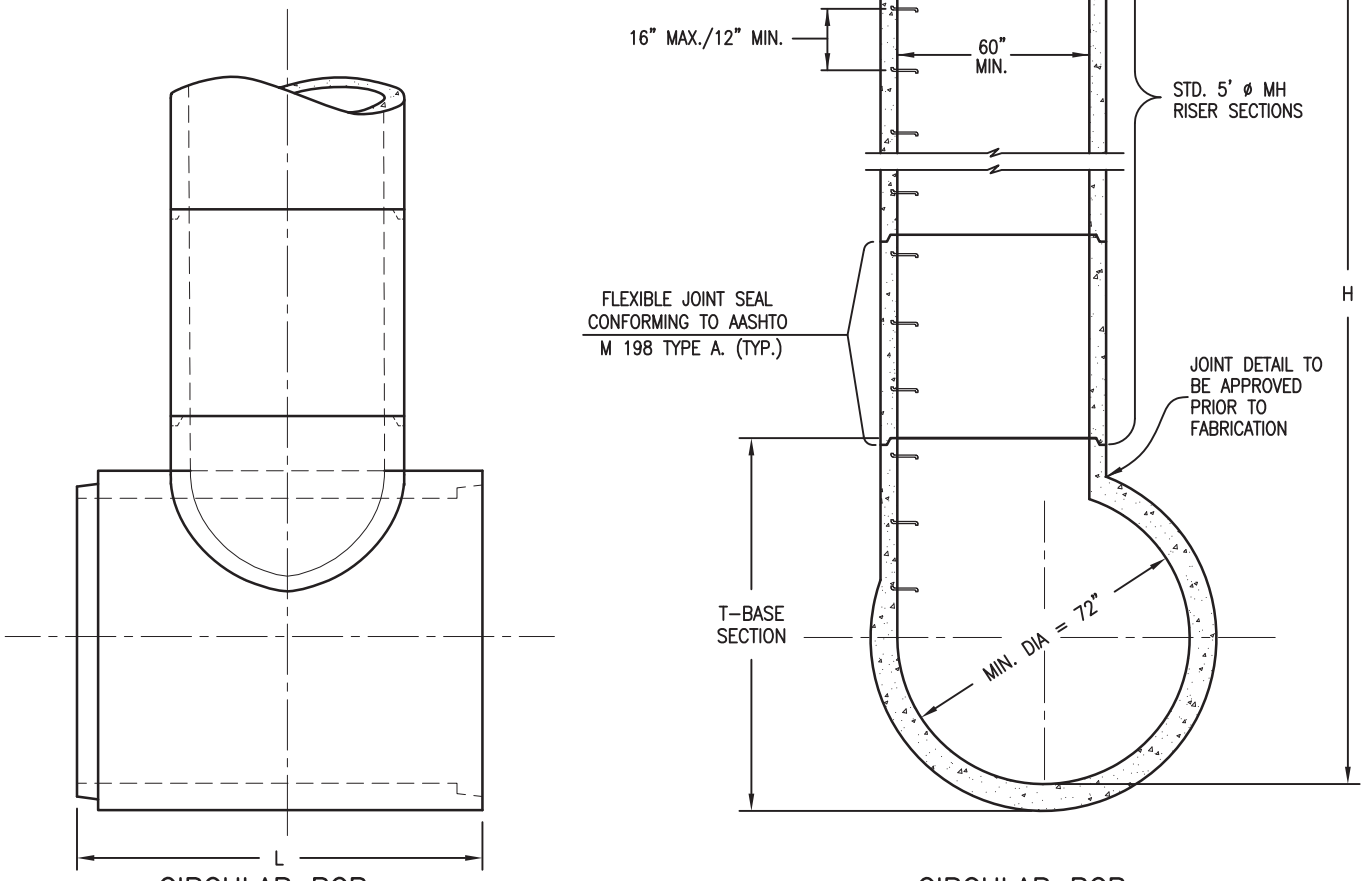
Issued: 05/2013

Revised: _____

Drawing No.
SP.43e

T–BASE MANHOLES:

1. THE T–BASE SECTION SHALL BE SHOP–FABRICATED FOR DELIVERY TO THE CONSTRUCTION SITE AS A COMPLETE UNIT.
2. THESE DETAILS SHALL ONLY BE CONSTRUED TO SHOW CONCEPTUAL AND STANDARD DIMENSIONAL REQUIREMENTS FOR TYPE T–BASE MANHOLES. THE CONTRACTOR SHALL FURNISH DETAILED SHOP DRAWINGS FOR APPROVAL PRIOR TO FABRICATION. THE DETAILS SHOWN HEREIN APPLY ONLY TO 72–INCH DIAMETER PIPE AND LARGER.
3. EXCEPT FOR CLASS OF PIPE, SPECIFICATIONS TO BE MET FOR THE MANHOLE SHALL BE THE SAME AS THOSE REQUIRED FOR THE ADJOINING PIPE CULVERT OR SEWER.
4. THE T–BASE SECTION SHALL MAINTAIN ITS INTERNAL SHAPE AND FLOW AREA WITH ANY GROUTING, ETC. APPLIED SO AS TO NOT DISTURB THE NORMAL FLOW OR REDUCE THE AREA.



MANHOLE T–BASE

REFERENCE:

CDOT M & S STANDARDS
M-604-20

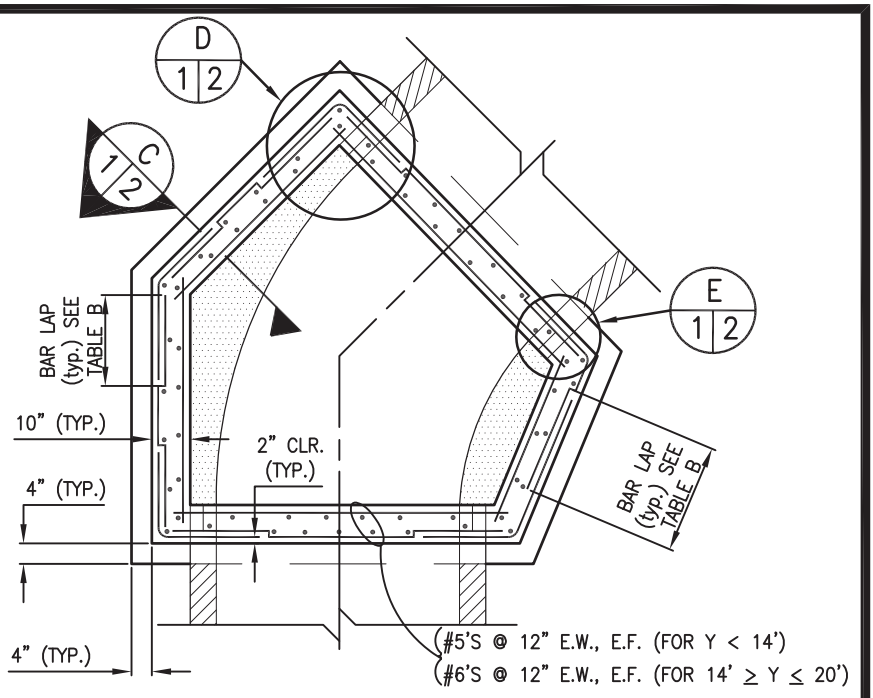
MANHOLES

DOUGLAS COUNTY
COLORADO

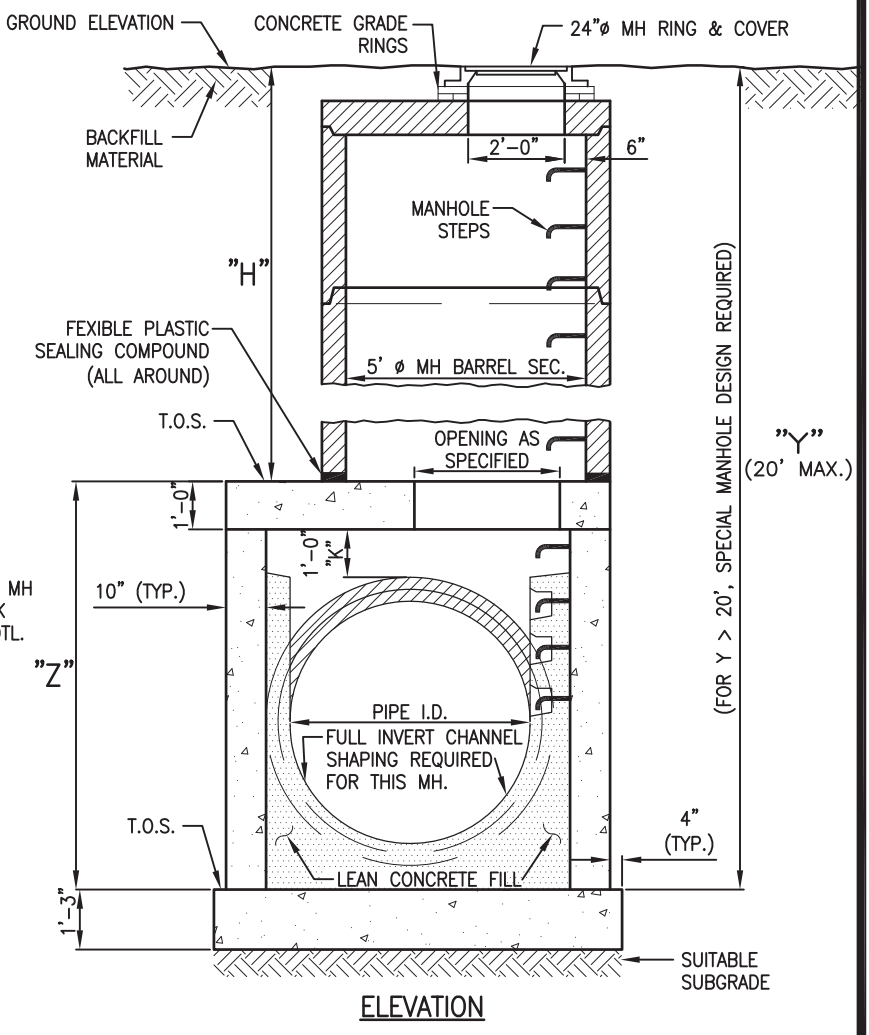
Issued: 05/2013

Revised:

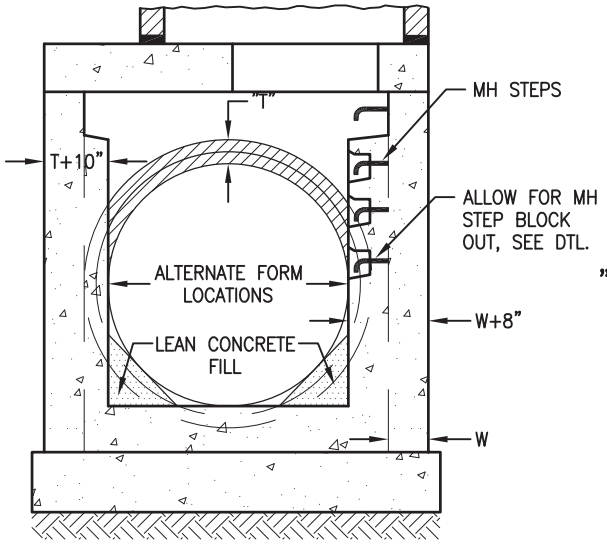
Drawing No.
SP.43f



PLAN



ELEVATION



FORMED IN PLACE CHANNEL
W/STEP BLOCK OUT
(MONOLITHIC POUR)

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-504.1

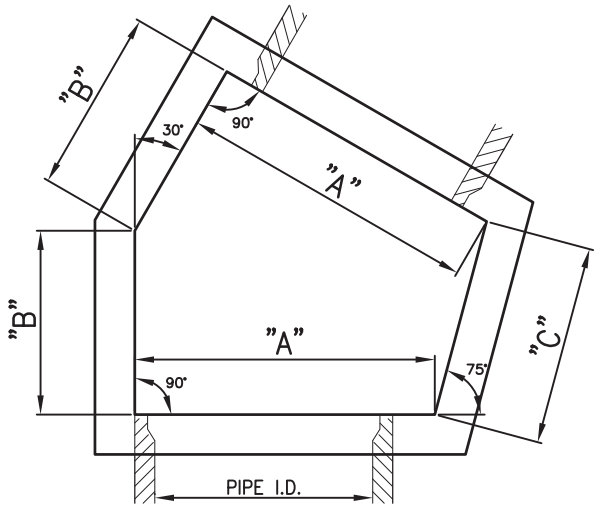
TYPE "P" MANHOLE

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

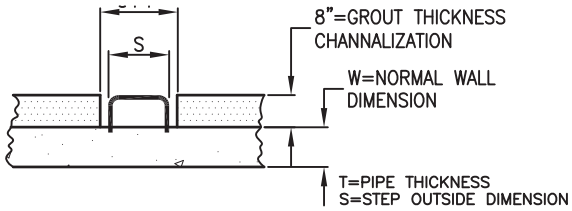
Revised:

Drawing No.
SP.44a

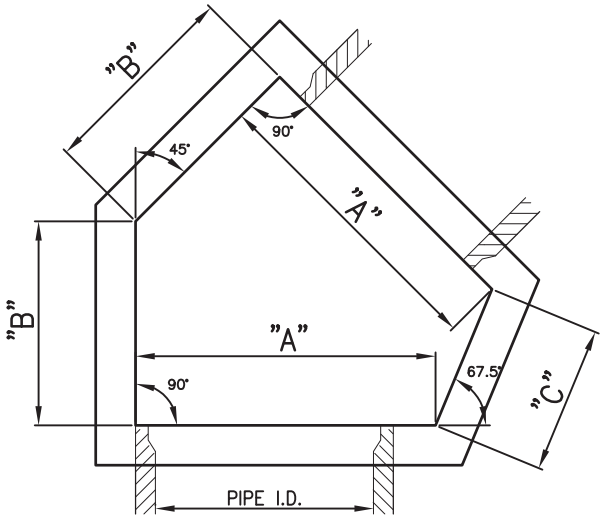


STRUCTURE DIMENSIONS 30° BEND

PIPE SIZE	"A"	"B"	"C"
60"	6' – 3"	3' – 10"	4' – 2"
66"	6' – 10"	4' – 0"	4' – 2"
72"	7' – 5"	4' – 2"	4' – 2"
78"	8' – 0"	4' – 4"	4' – 2"



STEP BLOCK OUT DETAIL



STRUCTURE DIMENSIONS 45° BEND

PIPE SIZE	"A"	"B"	"C"
60"	6' – 3"	4' – 3"	3' – 0"
66"	6' – 10"	4' – 6"	3' – 0"
72"	7' – 5"	4' – 9"	3' – 0"
78"	8' – 0"	5' – 0"	3' – 0"

GENERAL NOTES

1. THIS MANHOLE IS APPLICABLE ONLY WHERE SPECIFIED ON THE DRAWINGS.
2. TOTAL "Y" DEPTH IS LIMITED TO 20' MAXIMUM. FOR Y > 20' A SPECIAL DESIGN IS REQUIRED.
3. PRECAST MH BARRELS AND SECTIONS SHALL CONFORM TO ASTM C-478. IN ADDITION, MANHOLE STEPS, BARRELS, SHIPLAP JOINTS, RING & COVER SHALL CONFORM TO ALL APPLICABLE DOUGLAS COUNTY STANDARDS.
4. WALLS SHALL BE FORMED ON BOTH SIDES.
5. CAST-IN-PLACE MANHOLE SHALL BE CLASS D CONCRETE AND SHALL CONFORM TO DOUGLAS COUNTY STANDARD SPECIFICATIONS FOR REINFORCED CONCRETE STRUCTURES AND THE STANDARD CONSTRUCTION SPECIFICATIONS EXCEPT AS AMENDED BELOW.
6. ALL REINFORCING STEEL SHALL HAVE A MINIMUM YIELD STRENGTH OF 60,000 PSI. VERTICAL STEEL SHALL BE PLACED AT ℄ OF WALL. ALL BARS SHALL HAVE A 2" MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
7. CLEAR COVER REQUIREMENT (UNLESS OTHERWISE NOTED) TO BE 2" (3" FROM BOTTOM OF FOUNDATION SLAB.)
8. LATERAL SUPPORT SHALL BE PROVIDED AND MAINTAINED FOR WALLS DURING BACKFILLING OPERATIONS.
9. BEFORE CONCRETE IS PLACED, DESIGN DRAWINGS & PLACING DRAWINGS WILL BE CHECKED TO INSURE THE PROPER PLACEMENT OF EMBEDDED ITEMS, PIPE, REINFORCING STEEL, MANHOLE RINGS, KEYWAYS, ETC.
10. ALL REINFORCING BARS WILL BE PLACED ONLY AS SHOWN ON DOUGLAS COUNTY APPROVED DETAILS (PLACING) DRAWINGS.
11. REINFORCING BARS WILL BE SPLICED ONLY AT LOCATIONS SHOWN AND DETAILED ON THE DRAWINGS. BARS WILL BE WIRE-TIED, NO TACK WELDING WILL BE PERMITTED. MINIMUM BAR BENDING DIAMETER IS SIX TIMES THE DIAMETER OF THE REBAR BEING BENT.
12. SHOP DRAWINGS (PLACEMENT DRAWINGS) WILL BE REQUIRED.
13. REINFORCEMENT IN WALLS & BASE SLAB IS VARIED BY DESIGN HEIGHT "Y".
14. WHEN DIMENSION H < 2' SET TOP SLAB ELEVATION NO MORE THAN 12" + BELOW FINAL GRADE TO ALLOW COVER FOR MH RING & COVER, CONCRETE GRADE RINGS. DIMENSION K MAY BE GREATER THAN 12".
15. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
16. STEPS SHALL BE PROVIDED WHEN MANHOLE DEPTH EXCEEDS 3'-6" AND SHALL BE IN ACCORDANCE WITH AASHTO M 199.
17. ALL GRATES AND FRAMES SHALL BE GRAY OR DUCTILE CAST IRON CONFORMING TO CDOT STANDARD SPECIFICATION, SUBSECTION 712.06. GRATES AND FRAMES SHALL BE DESIGNED TO WITHSTAND HS 20 LOADING.
18. THE MH RING (FRAME) SHALL BE SET ON CONCRETE GRADE RINGS. THE FRAME SHALL BE SURROUNDED WITH A CONCRETE COLLAR IN UNPAVED AREA AND CONCRETE PAVEMENT, OR FULL DEPTH ASPHALT IN ASPHALT PAVEMENT. SEE DETAILS ON STANDARD DETAIL SD-6, SHEETS 2 AND 3.
19. IF ANY REBAR HAS TO BE CUT ON THE JOB SITE, THE EXPOSED BARE STEEL SHALL BE IMMEDIATELY COVERED WITH A MANUFACTURE APPROVED EPOXY PAINT PRIOR TO POUR.
20. ALL PIPE ENTRIES INTO THE BASE OF MANHOLE SHALL BE CONNECTED BY OPEN CHANNELIZATION ADJUSTED FOR PIPE SIZE, SHAPE, SLOPE, AND DIRECTION OF FLOW. DETAILS SHOWN ARE TYPICAL FOR INSTALLATIONS WITH ALL INVERTS OF SAME RELATIVE ELEVATION. FOR EXCESSIVE ELEVATION DIFFERENCE BETWEEN INVERTS, SPECIAL BASE/CHANNEL DETAILS WILL BE SHOWN ON THE PLANS.
21. FLOW CHANNELS AND INVERTS SHALL BE FORMED BY SHAPING WITH CLASS B CONCRETE.
22. STUB-OUTS SHALL EXTEND A MINIMUM OF 1 PIPE SECTION BEYOND OUTSIDE WALL SURFACE OF MANHOLE AND BE SATISFACTORILY PLUGGED.
23. THE SLOPE OF THE MANHOLE COVER SHALL MATCH THE ROADWAY PROFILE AND CROSS SLOPE.

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-504.1

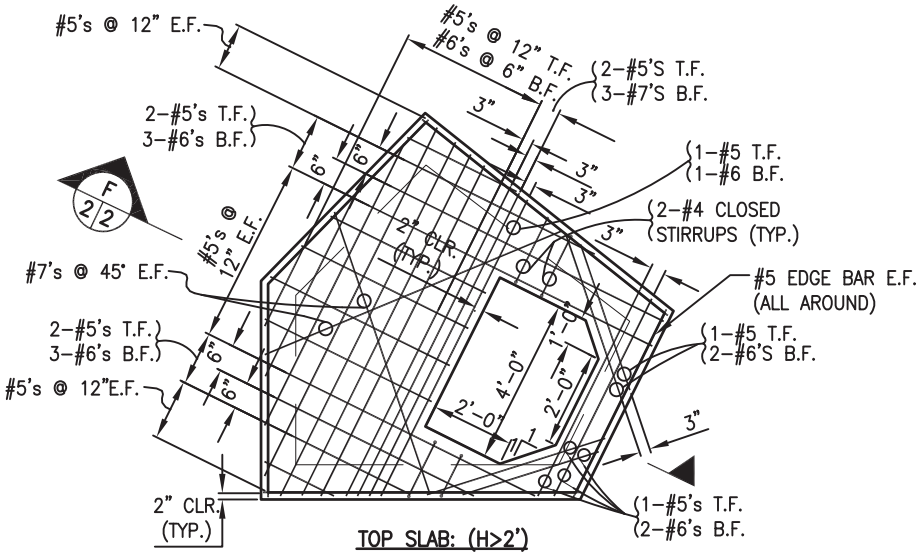
TYPE "P" MANHOLE

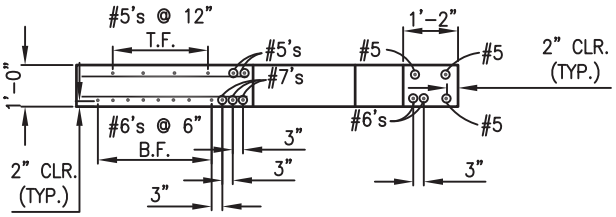
DOUGLAS COUNTY
COLORADO

Issued: 05/2013

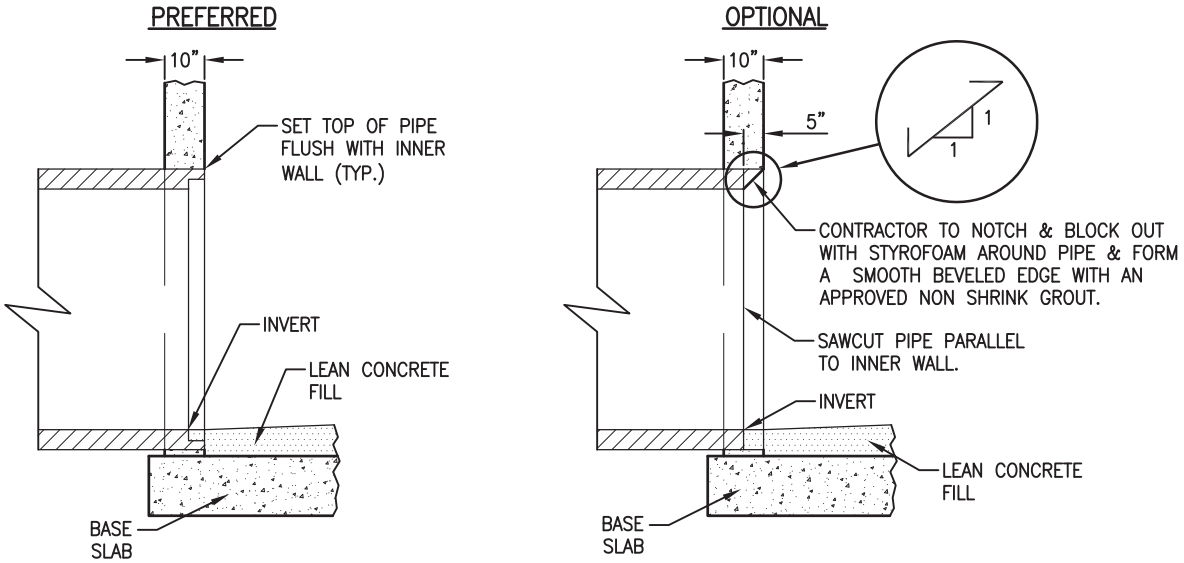
Revised:

Drawing No.
SP.44b





F 2 2 TOP SLAB SECTION (H>2')



E 1 2 DETAIL (PIPE END TREATMENT)

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-504.1

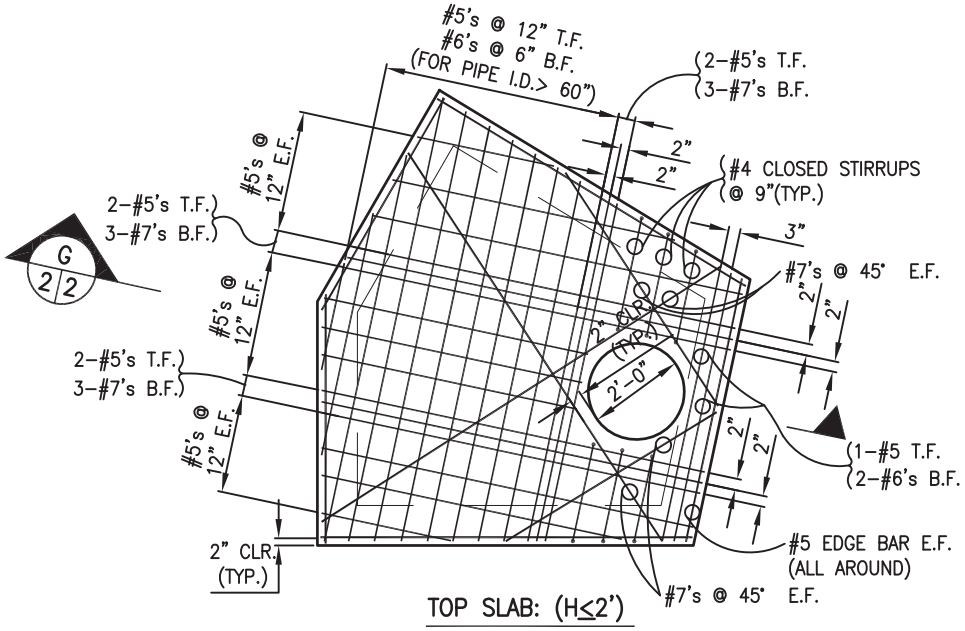
TYPE "P" MANHOLE

DOUGLAS COUNTY
COLORADO

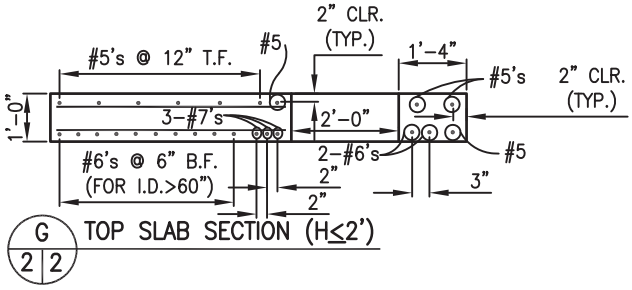
Issued: 05/2013

Revised:

Drawing No.
SP.44c



TOP SLAB: (H≤2')

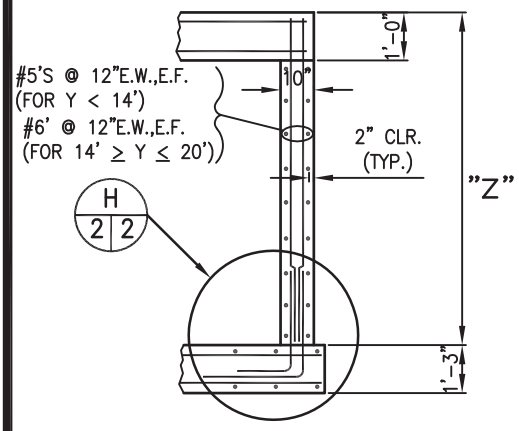


TOP SLAB SECTION (H≤2')

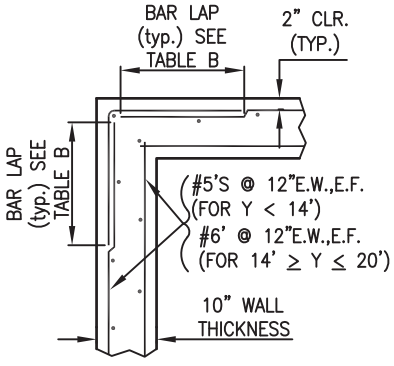
TABLE "B"

BAR SIZE	SPLICE LENGTH (LAP)
#5	1'-9"
#6	2'-2"

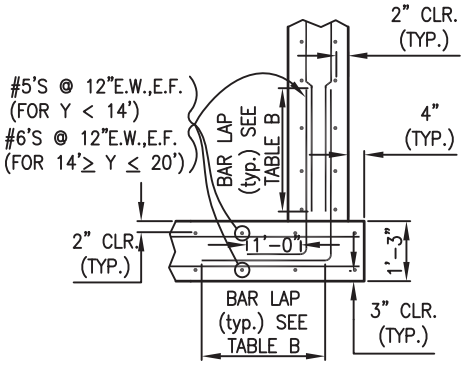
NOTE: BARS TO BE SPLICED ONLY AT LOCATIONS SHOWN.



C 1 2 SECTION (TYP. WALL)



D 1 2 DETAIL (TYP. CORNER)



H 2 2 DETAIL

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-504.1

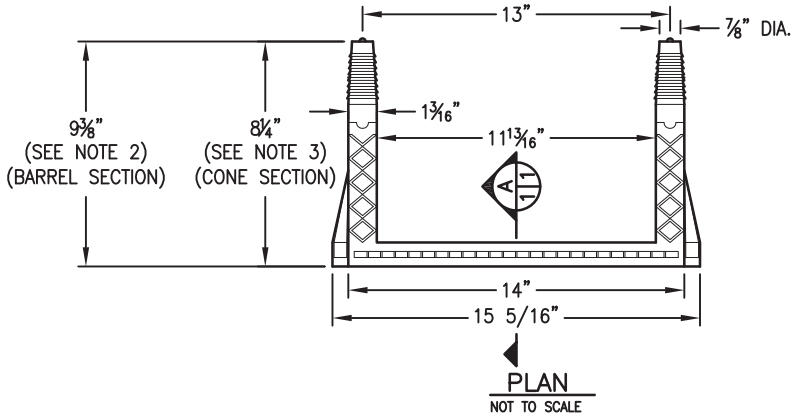
TYPE "P" MANHOLE

DOUGLAS COUNTY
COLORADO

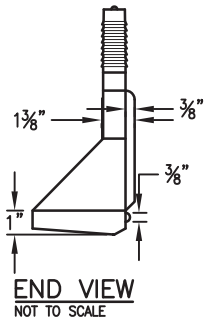
Issued: 05/2013

Revised:

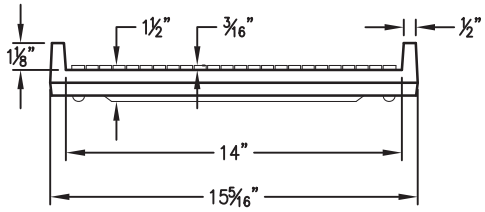
Drawing No.
SP.44d



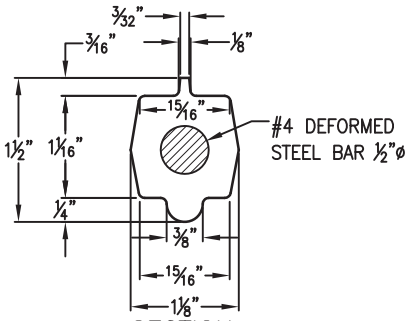
PLAN
NOT TO SCALE



END VIEW
NOT TO SCALE



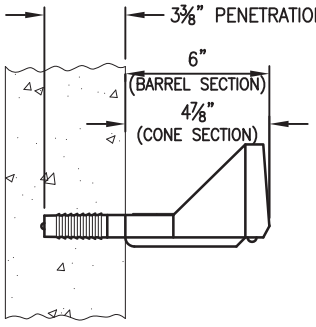
ELEVATION
NOT TO SCALE



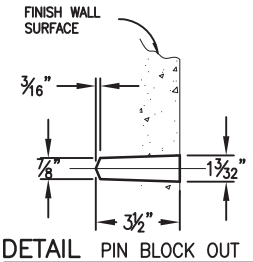
SECTION
NOT TO SCALE

GENERAL NOTES

1. ASTM SPECIFICATIONS:
   A. ASTM C-478
   B. ASTM A-615 GRADE 60 (STEEL REBAR).
   C. ASTM 2146-69, TYPE III, GRADE 16906 (POLYPROPYLENE).
2. STEPS INSTALLED IN MANHOLE BARREL SECTIONS OR VERTICAL WALLS OF STRUCTURES SHALL HAVE A 9⅜" LEG AND SHALL PROJECT FROM THE WALL 6".
3. STEPS INSTALLED IN MANHOLE CONE SECTIONS SHALL HAVE AN 8¼" LEG AND SHALL PROJECT FROM THE WALL 4⅞".
4. ALL STEPS SHALL HAVE A PENETRATION DEPTH INTO THE WALL OF 3⅜".
5. STEPS SHALL BE INSTALLED BY THE "PRESS-FIT" METHOD UTILIZING A SPECIALLY TAPERED PIN TO FORM THE INSERT HOLE AS SHOWN, FOLLOWING MANUFACTURER'S RECOMMENDED PROCEDURE AND SHALL NOT BE GROUTED IN PLACE.
6. INSTALLED STEPS SHALL BE CAPABLE OF WITHSTANDING A PULL OUT FORCE OF 2500 LB. PER LEG FOR A MINIMUM PERIOD OF TWO MINUTES.
7. PINS MUST BE SMOOTH AND CONTINUOUSLY TAPERED. DIMENSIONS OF THE PIN AND THE INSERTED PORTION OF THE MANHOLE STEP ARE TYPICAL ONLY. DOUGLAS COUNTY INSTALLATIONS REQUIRE A MATCHED COMBINATION OF A TAPERED INSERT PIN AND MANHOLE STEP, AS RECOMMENDED OR REQUIRED BY SPECIFIC MANUFACTURER OF THE STEP TO BE USED.
8. THIS STEP CAN ALSO BE USED IN TOE POCKET INSTALLATIONS PROVIDED 5" TOE CLEARANCE IS ALLOWED.



DETAIL
NOT TO SCALE



DETAIL PIN BLOCK OUT
NOT TO SCALE

POLYPROPYLENE REINFORCED PLASTIC STEP

REFERENCE:

CITY AND COUNTY OF DENVER
DRAWING NUMBER S-750

MANHOLE AND INLET STEPS

DOUGLAS COUNTY
COLORADO

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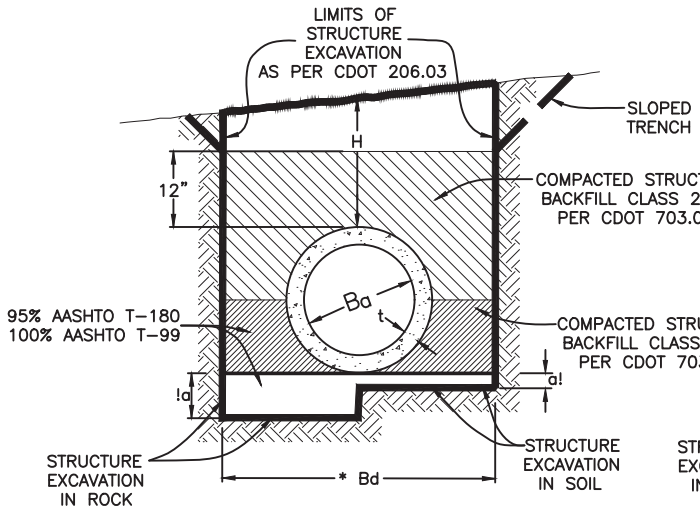
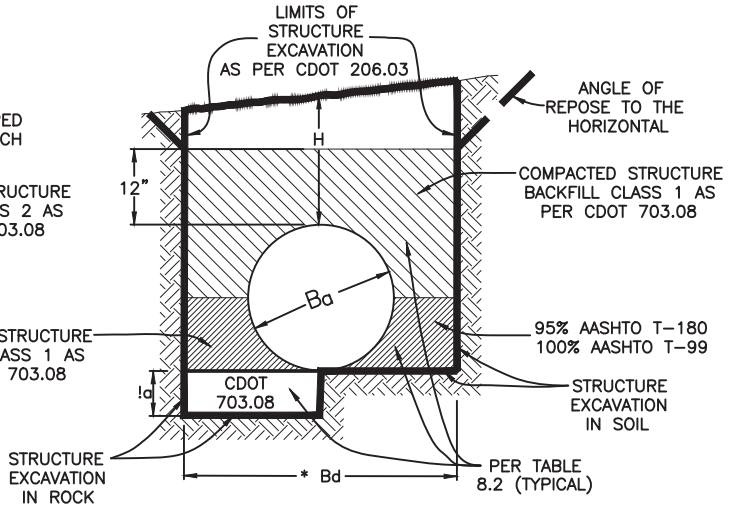
SP.45

RIGID PIPE



FLEXIBLE PIPE



MAXIMUM HEIGHT OF FILL OVER TOP OF PIPE IN FEET

REINFORCED CONCRETE

Ba in.	Min. Bd in. **	.01 INCH CRACK D-LOAD 1350 PIPE CLASS III	2000 PIPE CLASS IV	3000 PIPE CLASS V
18	35	19	28	43
24	42	18	28	42
30	50	18	28	42
36	59	18	27	41
42	68	18	27	41
48	78	18	27	41
54	89	17	26	40
60	98	17	26	40
66	108	17	26	40
72	117	17	26	40
78	125	17	26	40
84	135	17	26	40
90	154	17	26	40
96	163	17	26	40
108	173	17	26	40
120	191	17	26	40
132	208	17	26	40
144	224	17	26	40

** Based on Bd=1.33(Ba+2t). Wall thickness can vary between manufacturers.

STEEL - 2 2/3" x 1/2" CORRUGATIONS

Ba in.	Bd ft.	H ABOVE TOP OF PIPE IN FEET 1-15	16-20	21-25	26-30	31-35	36-40
		THICKNESS IN INCHES					
18-48	4-7	.064	.064	.064	.064	.064	.064
54	7.50	.079	.079	.079	.079	.079	.079
60	8.00	.079	.079	.079	.079	.109	.109
66	8.50	.079	.079	.109	.109	.138	.138
72	9.00	.079	.109	.109	.138	.168	.168
78	9.50	.109	.138	.138	.168		
84	10.00	.109	.138	.168			

LEGEND

H = Height of fill over top of pipe
Ba = inside diameter (I.D.) of pipe
* Bd = Trench Width
t = Wall thickness of pipe
CLSM = Controlled Low Strength Material
a = Loose granular bedding, as follows:
a=0" for Flexible Culverts in Soil.
a=3" for RCP Culvert in Soil.
a=12" for Culvert in Rock.

* TRENCH WIDTHS
RCP: Bd = Min. of 1.33(Ba+2t), or (Ba+2t)+12" (Per AASHTO Section 17)
CSP: Bd = Min. of Ba+4' (Per AASHTO Section 12)

! Bedding material for SOIL shall be Structural Backfill Class 1 or 2.
! Bedding material for ROCK shall be Structural Backfill Class 1.

GENERAL NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT.
2. ALL TRENCH INSTALLATIONS SHALL BE IN ACCORDANCE WITH OSHA AND COLORADO DEPARTMENT OF TRANSPORTATION REGULATIONS.
3. THE USE OF NON-REINFORCED CONCRETE PIPE WILL NOT BE ALLOWED IN DOUGLAS COUNTY.

RCP DESIGN CRITERIA

Safety Factor = Per ASTM C76
Soil Weight = 120 lb. per cu. ft.
Bedding = Type 2

ALL UTILITY REPAIRS MUST BE BACKFILLED WITH CLSM. SEE DOUGLAS COUNTY ROADWAY DESIGN AND CONSTRUCTION STANDARDS MANUAL FOR SPECIFIC DETAILS.

CSP DESIGN CRITERIA

(3"x1" CORRUGATIONS: 60 TO 84 Pipe shall be .064" thick (16 gauge) to H=40 ft.)

Soil Weight = 120 lb. per cu. ft.
Safety Factor for Seam Strength = 2.00
Bucking Stress Level = 1/2 Yield Strength
Load Factor (Backfill) = 95% Standard Density, AASHTO-T 99 (K=0.86)

NOTE: All trenching shall comply with all State, Federal and O.S.H.A. safety requirements. It will be the responsibility of the Contractor to meet all safety requirements.

TO BE USED IN OPEN FIELDS OR PRIOR TO PAVING ROADS

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING
DATE 06/18/2021

PIPE INSTALLATION IN TRENCH

DOUGLAS COUNTY COLORADO

Issued: 05/2013
Revised: 05/2021

Drawing No.
SP.46a

NOTES:

1. This trench backfill detail specifies requirements in addition to those specified in the latest edition of the Colorado Department of Transportation's Standard Specifications for Road and Bridge Construction.

2. A construction traffic control plan shall be submitted to and approved by Douglas County prior to issuance of construction permits in the County right–of–way.

3. Trench shall be braced or shored as necessary for the safety of the workers and protection of other utilities or structures in accordance with applicable local, state and federal safety regulations.

4. The trench width shall be confined to those minimum dimensions, which will permit proper installation and acceptable pipe loading, as established by current local, state and federal Safety regulations.

5. Backfill compaction requirements: Minimum density will be determined in accordance with AASHTO T 99 or T 180 as defined by CDOT Standard Specifications Section 203.07 and CDOT 703.03. Except for CLSM.

6. Pavement edges shall be saw–cut. Edges shall be tack coated prior to patching.

7. All storm sewers shall be constructed so that a minimum cover is maintained to withstand AASHTO HS–20 loading on the pipe. The minimum cover to withstand live loading depends upon the pipe size, type and class, and soil bedding condition, but shall be not less than 1–foot at any point along the pipe. Other factors that affect the depth of the pipe are hydraulic grade line elevations, inlet depths, adjacent utilities or utility crossings, including water and sewer services lines along residential streets, and connections to existing storm sewer systems. The roadway subgrade, which supports the pavement section is typically plowed to a certain depth, moisture treated and compacted prior to the placement of the sub–base, base course, and surfacing. There are also instances where the subgrade material must be excavated and replaced or treated to a certain depth to mitigate swelling soils. These efforts can impact the storm sewer system if it has not been designed with adequate depth. The design engineer shall use the best information available, including pavement design or soils reports (if available) to ensure that storm sewer pipes have adequate depth.

8. Changes in design criteria will require compensating change in pipe design.

9. When pipe sewer is to be extended or replaced with pipe of different material, the connections shall conform to the detail shown on plans or be approved through Douglas County Engineering.

10. When two or more conduits are laid side–by–side, they shall be placed so that they are ½ outside diameter, or ½ outside span, or 3' apart, whichever is less. However, if end sections are used, the minimum spacing shall be 1' between the outside edge of end sections.

11. TRENCH INSTALLATION (per OSHA Standards):

    a. Trenches over 5 feet in depth shall be either shored or the trench walls shall be sloped no steeper than 3:1 to the angle of repose. If sloped, the bottom of the slope shall be a minimum of 1 foot above the top of the pipe.

    b. Shoring will be required when the bottom of the slope is more than 3 feet above the bottom of the trench.

    c. All sheeting or shoring to be removed.

12. CLSM may be used in place of Structural Backfill.

13. CLSM shall not exceed a strength over 100 p.s.i.

REFERENCE: Douglas County Drainage Manual and Colorado Department of Transportation "M" Standards.

TO BE USED IN OPEN FIELDS OR PRIOR TO PAVING ROADS

APPROVED BY DOUGLAS COUNTY

Janet Herman

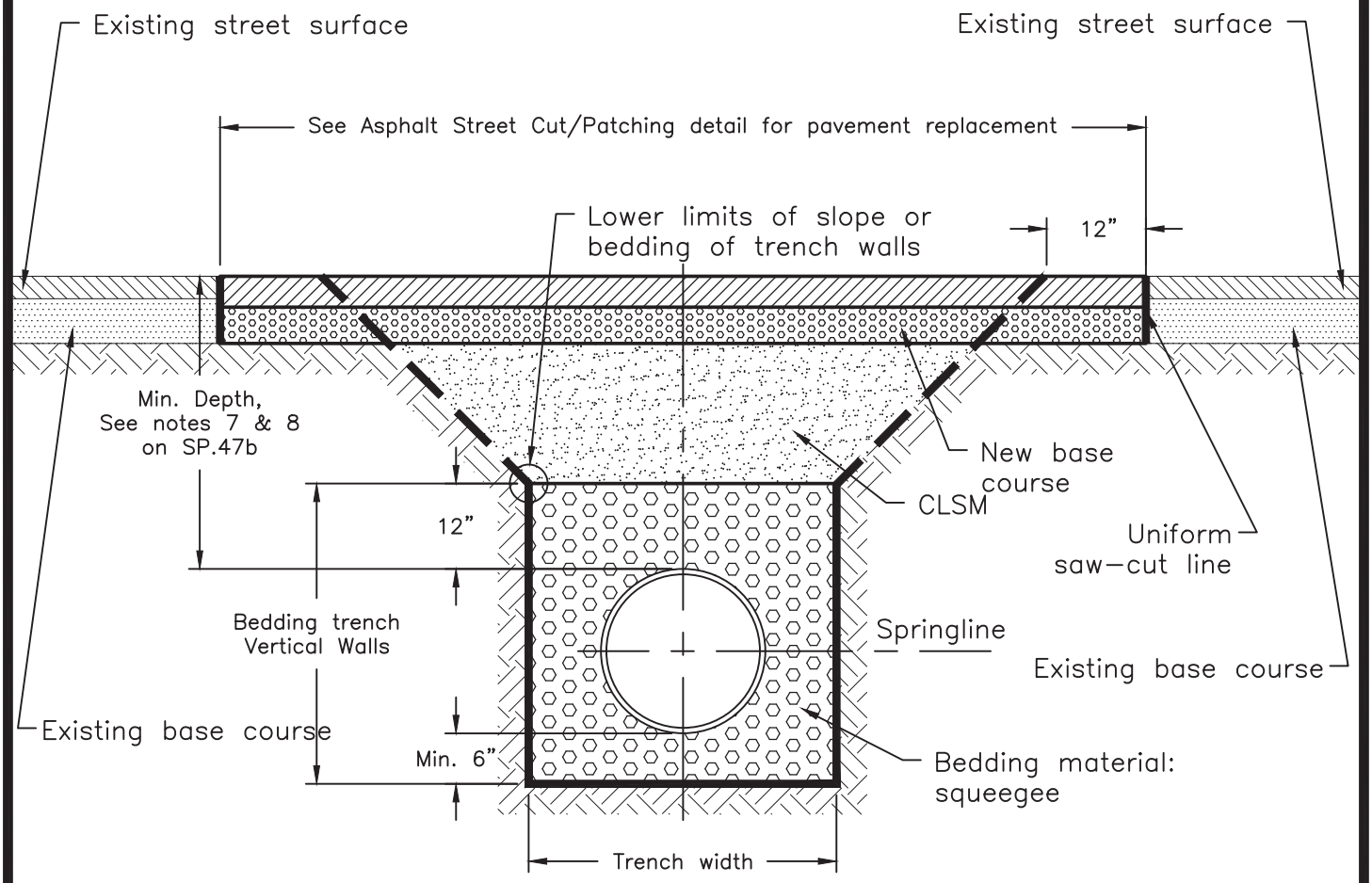
JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS
ENGINEERING
DATE 06/18/2021

PIPE INSTALLATION IN TRENCH NOTES

DOUGLAS COUNTY
COLORADO

Issued: 05/2013
Revised: 05/2021

Drawing No.
SP.46b



NOTE: SEE NOTES ON SP.47b

TO BE USED FOR STREET CUT ONLY

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS
ENGINEERING
DATE 06/18/2021

PIPE INSTALLATION IN TRENCH FOR STREET CUT

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised: 05/2021

Drawing No.
SP.47a

NOTES:

1. This Pipe Installation detail specifies requirements in addition to those specified in the latest edition of the Colorado Department of Transportation's Standard Specifications for Road and Bridge Construction.
2. A Construction Traffic Control Plan shall be submitted to and approved by Douglas County prior to issuance of Construction Permits in the County Right–Of–Way.
3. Pipe shall be bedded from 6" below the bottom of the pipe to 12" above the top of pipe.
4. Trench width shall not be more than 16" and not less than 12" wider than the largest Outside Diameter of the pipe.
5. All storm sewers shall be constructed so that a minimum cover is maintained to withstand AASHTO HS–20 loading on the pipe. The minimum cover to withstand live loading depends upon the pipe size, type and class, and soil bedding condition, but shall be not less than 2–foot at any point along the pipe.
6. For water and sanitary sewer pipes, refer to the maintaining district standards for pipe bedding materials.
7. Pavement edges shall be saw–cut and kept to a neat vertical edge prior to paving.
8. Edges shall be tack coated prior to patching.
9. When storm sewer pipe is to be extended or replaced with pipe of different material, the connections shall conform to the detail shown on plans or be approved through Douglas County Engineering.
10. When two or more conduits are laid side–by–side, they shall be placed so that they are ½ outside diameter, or ½ outside span, or 3' apart, whichever is less. However, if end sections are used, the minimum spacing shall be 1' between the outside edge of end sections.
11. Trench installation per OSHA Standards.

TO BE USED FOR STREET CUT ONLY

APPROVED BY DOUGLAS COUNTY

Janet Herman

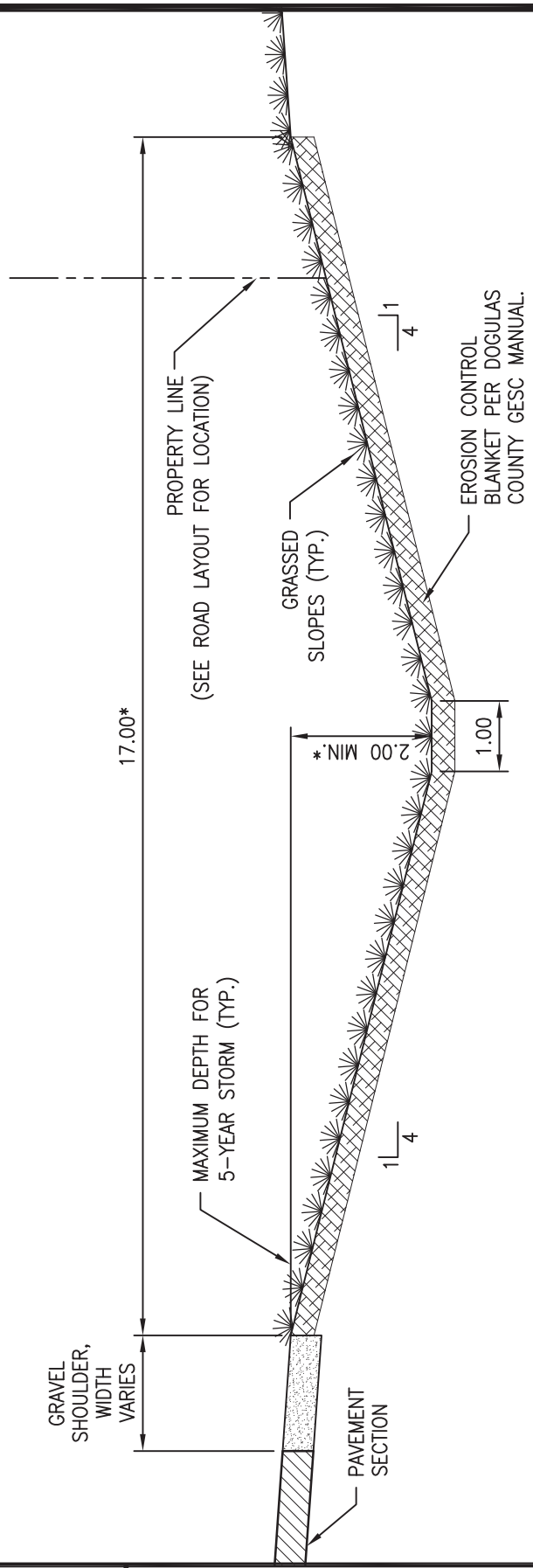
JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS
ENGINEERING
DATE 06/18/2021

PIPE INSTALLATION IN TRENCH FOR STREET CUT NOTES

DOUGLAS COUNTY
COLORADO

Issued: 05/2013
Revised: 05/2021

Drawing No.
SP.47b



ALLOWABLE LONGITUDINAL SLOPE FROM 0.5% TO 3.0%

* - MINIMUM WIDTH AND DEPTH OF DITCH VARIES BASED ON DRIVEWAY CULVERT SIZE.

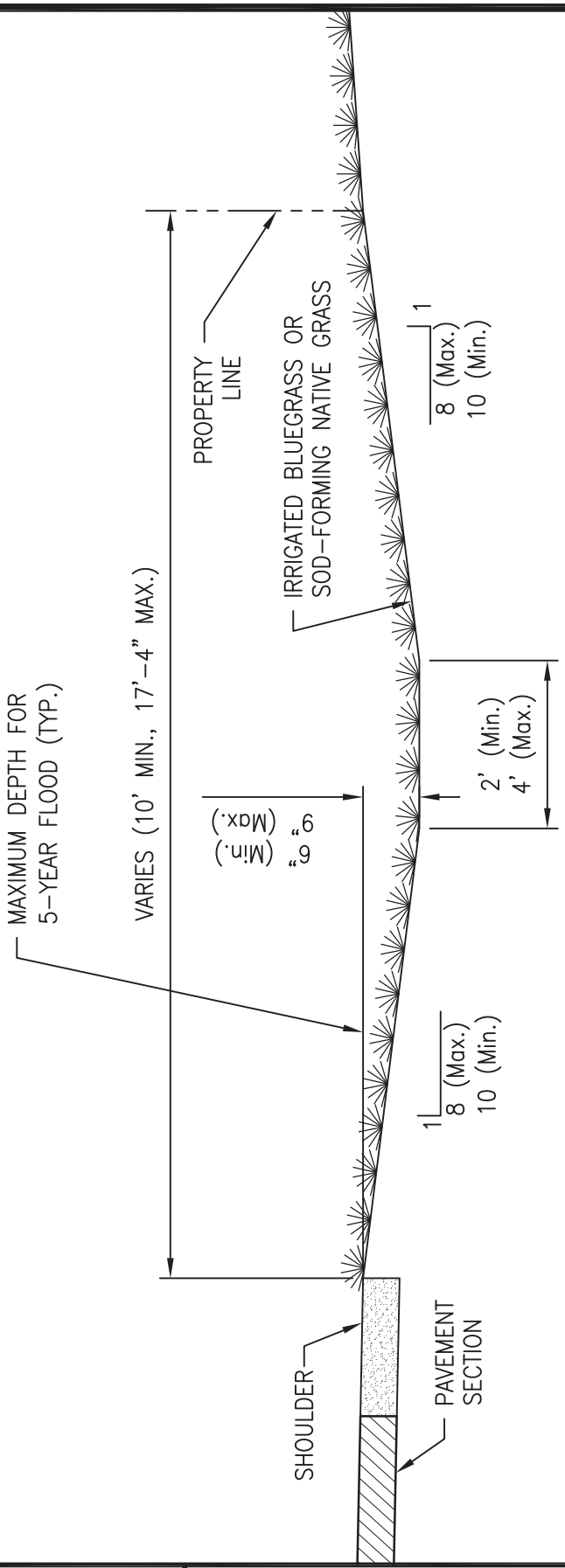
ROADSIDE DITCH SECTION

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised: _____

Drawing No.
SP.48



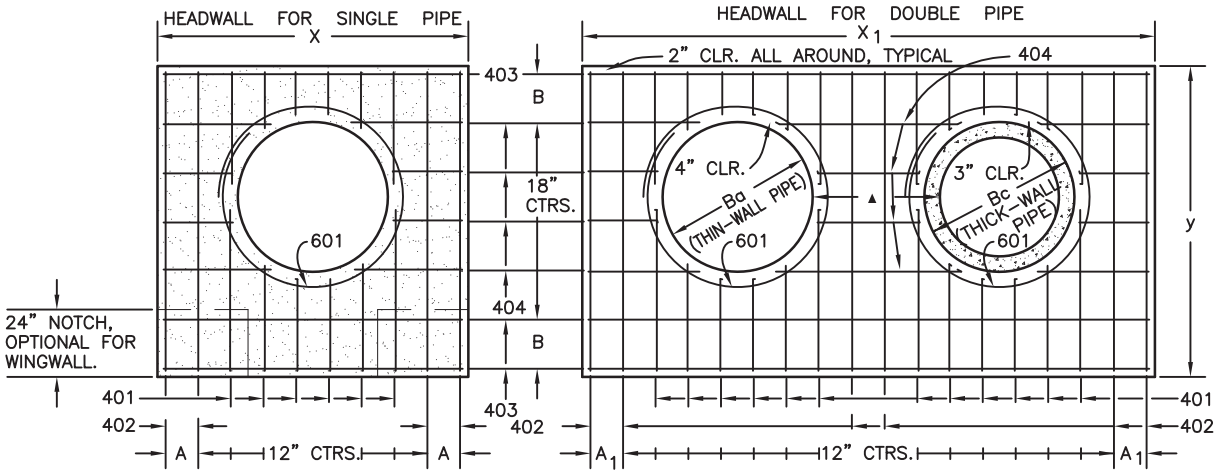
URBAN ROADSIDE SWALE

DOUGLAS COUNTY
COLORADO

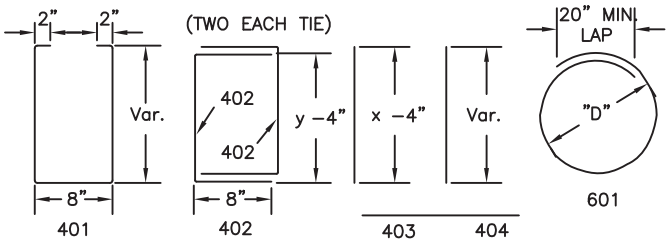
Issued: 05/2013

Revised: _____

Drawing No.
SP.49



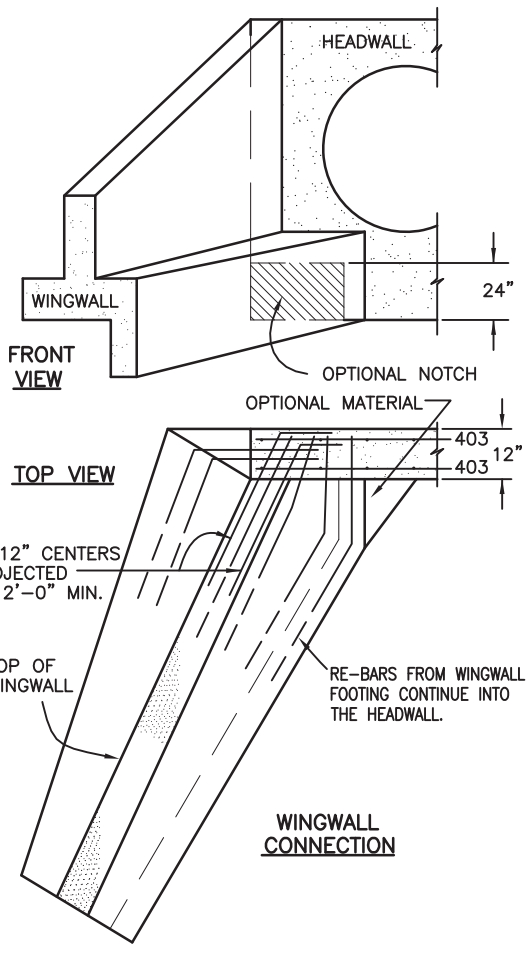
TYPICAL BAR LAYOUT FOR CONCRETE HEADWALLS



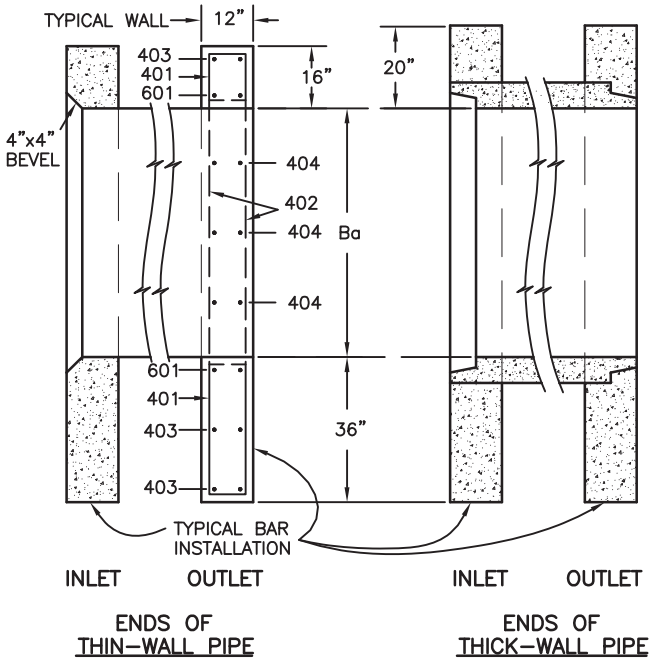
"D" FOR

THICK–WALL PIPE, = Bc + 6"
THIN–WALL PIPE, = Ba + 8"
THIN–WALL PIPE–ARCH = SPAN + 8"
STRUCTURAL PLATE–ARCH = RISE + 8"

BAR BENDING



WINGWALL CONNECTION



ENDS OF THIN–WALL PIPE

ENDS OF THICK–WALL PIPE

REFERENCE:

CDOT M & S STANDARDS
M-601-10

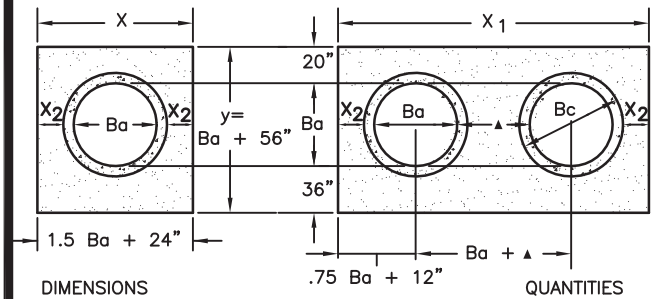
HEADWALLS FOR PIPE CULVERTS

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

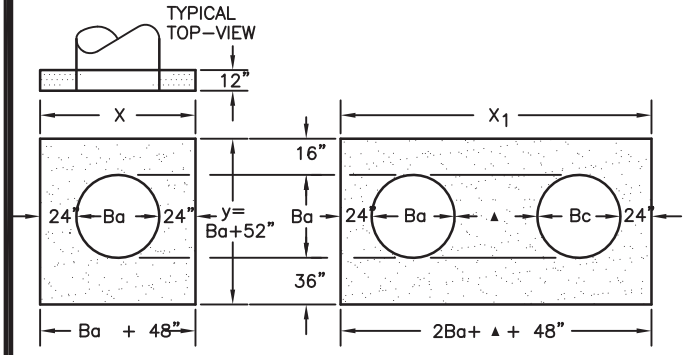
Drawing No.
SP.50a



DIMENSIONS — QUANTITIES

Ba in.	Bc in.	X ft.–in.	A in.	X_1 ft.–in.	A_1 in.	y ft.–in.	B in.	X_2 in.	CONCRETE SGL cu.yd.	CONCRETE DBL cu.yd.	STEEL ▣ SGL lbs.	STEEL ▣ DBL lbs.
54	65	8–9	8½	15–6	7	9–2	17	20	2.12	3.55	209	364
60	72	9–6	7	17–0	10	9–8	11	21	2.35	3.99	236	414
66	79	10–3	11½	18–6	7	10–2	14	22	2.60	4.44	249	453
72	86	11–0	10	20–0	10	10–8	17	23	2.85	4.91	270	476
78	93	11–9	8½	21–3	11	11–2	11	24	3.11	5.29	306	527
84	100	12–6	7	22–6	7	11–8	14	25	3.38	5.68	333	572
90	107	13–3	11½	23–9	8½	12–2	17	26	3.66	6.08	335	593
96	114	14–0	10	25–0	10	12–8	11	27	3.94	6.48	379	649
102	121	14–9	8½	26–3	11½	13–2	14	28	4.24	6.89	400	664
108	128	15–6	7	27–6	7	13–8	17	29	4.54	7.30	424	707

HEADWALL FOR THICK – WALL ROUND PIPE



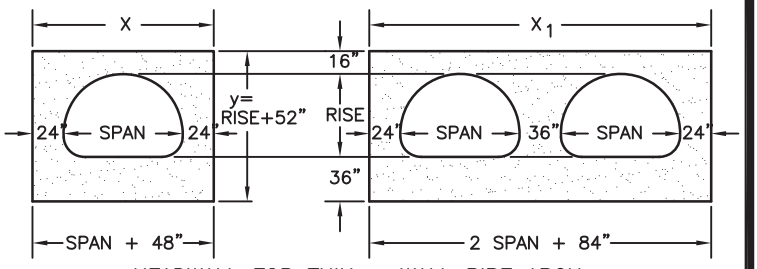
DIMENSIONS — QUANTITIES

Ba in.	X ft.–in.	A in.	X_1 ft.–in.	A_1 in.	y ft.–in.	B in.	CONCRETE SGL cu.yd.	CONCRETE DBL cu.yd.	STEEL ▣ SGL lbs.	STEEL ▣ DBL lbs.
54	8–6	7	15–3	11½	8–10	15	2.19	3.81	211	358
60	9–0	10	16–6	7	9–4	18	2.38	4.25	217	396
66	9–6	7	17–9	8½	9–10	12	2.58	4.70	252	454
72	10–0	10	19–0	10	10–4	15	2.78	5.17	255	472
78	10–6	7	20–0	10	10–10	18	2.98	5.56	276	499
84	11–0	10	21–0	10	11–4	12	3.19	5.95	297	553
90	11–6	7	22–0	10	11–10	15	3.40	6.36	317	571
96	12–0	10	23–0	10	12–4	18	3.62	6.79	321	597
102	12–6	7	24–0	10	12–10	12	3.84	7.21	364	663
108	13–0	10	25–0	10	13–4	15	4.06	7.63	362	678

HEADWALL FOR THIN – WALL ROUND PIPE

DIMENSIONS — QUANTITIES

EQUIV Ba in.	SPAN in.	RISE in.	X ft.–in.	A in.	X_1 ft.–in.	A_1 in.	y ft.–in.	B in.	CONCRETE SGL cu.yd.	CONCRETE DBL cu.yd.	STEEL ▣ SGL lbs.	STEEL ▣ DBL lbs.
72	81	59	10–9	8½	20–6	7	9–3	17½	2.72	5.10	250	467
78	87	63	11–3	11½	21–6	7	9–7	10½	2.85	5.34	275	531
84	95	67	11–9	8½	22–10	9	9–11	12½	3.08	5.79	290	547
90	103	71	12–7	7½	24–2	11	10–3	15	3.30	6.21	321	591
96	112	75	13–4	12	25–8	8	10–7	16½	3.52	6.65	314	606
102	117	79	13–9	8½	26–6	7	10–11	9½	3.63	6.86	356	672
108	128	83	14–8	8	28–4	12	11–3	11½	3.96	7.51	376	699



HEADWALL FOR THIN – WALL PIPE ARCH

DIMENSIONS — QUANTITIES

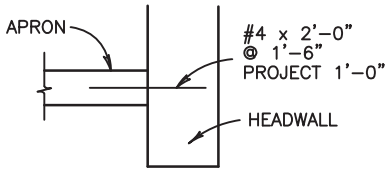
EQV. Ba in.	SPAN ft.–in.	RISE ft.–in.	X ft.–in.	A in.	X_1 ft.–in.	A_1 in.	y ft.–in.	B in.	CONCRETE SGL cu.yd.	CONCRETE DBL cu.yd.	STEEL ▣ SGL lbs.	STEEL ▣ DBL lbs.
66	6–1	4–7	10–1	10½	19–2	11	8–11	15½	2.52	4.70	232	424
75	7–0	5–1	11–0	10	21–0	10	9–5	9½	2.80	5.25	282	509
84	7–11	5–7	11–11	9½	22–10	9	9–11	12½	3.08	5.79	291	540
93	8–10	6–1	12–10	9	24–8	8	10–5	15½	3.36	6.33	309	622
102	9–9	6–7	13–9	8½	26–6	7	10–11	9½	3.63	6.86	379	673
111	10–11	7–1	14–11	9½	28–10	9	11–5	12½	4.05	7.67	377	711
120	11–10	7–7	15–10	9	30–8	8	11–11	15½	4.36	8.28	395	731
132	12–10	8–4	16–10	9	32–8	8	12–8	11	4.75	9.03	441	839
141	14–1	8–9	18–1	10½	35–2	11	13–1	13½	5.17	9.86	448	931
150	15–4	9–3	19–4	12	37–8	8	13–7	16½	5.69	10.88	490	953
159	15–10	9–10	19–10	9	38–8	8	14–2	11	5.89	11.25	534	1019

HEADWALL FOR STRUCTURAL PLATE ARCH

SKEW ANGLE A°	FACTOR (cosecA°)
90	1.000
85	1.004
80	1.015
75	1.035
70	1.064
65	1.103
60	1.155
55	1.221
50	1.305
45	1.414
40	1.556
35	1.743
30	2.000

SKEW FACTOR TABLE

HEADWALL SHALL BE PERPENDICULAR TO THE CULVERT CENTERLINE UNLESS OTHERWISE SPECIFIED. TABULATED DIMENSIONS AND QUANTITIES MUST BE ADJUSTED FOR SKEWED INSTALLATIONS.



WHEN APRON IS REQUIRED

GENERAL NOTES

1. CONCRETE SHALL BE CLASS D.
2. HEADWALL SHALL BE PERPENDICULAR TO THE CULVERT ℄ UNLESS OTHERWISE SHOWN ON THE PLANS. TABULATED DIMENSIONS AND QUANTITIES MUST BE ADJUSTED FOR SKEWED INSTALLATIONS.
3. FOR WINGWALL DETAILS, SEE STANDARD M–601–20.
4. VOLUME OCCUPIED BY PIPE HAS BEEN DEDUCTED FROM STEEL AND CONCRETE QUANTITIES.
5. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
6. ALL BARS SHALL HAVE A 2" MINIMUM CLEARANCE.
7. YEAR OF CONSTRUCTION STAMPED ON DOWNSTREAM HEADWALL PER DOUGLAS COUNTY SPECIFICATIONS.

▲ WHEN TWO OR MORE CONDUITS ARE LAID SIDE BY SIDE, THEY SHALL BE PLACED SO THAT THE ADJACENT PIPES WILL BE ½ INSIDE DIAMETER OR ½ INSIDE SPAN OR 3 FEET APART (INCLUDING WALL THICKNESS) WHICHEVER IS LESS.

■ ADD 0.89 x (X OR X_1) (LB.) WHEN APRON IS REQUIRED.

REFERENCE:

CDOT M & S STANDARDS
M–601–10

HEADWALLS FOR PIPE CULVERTS

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

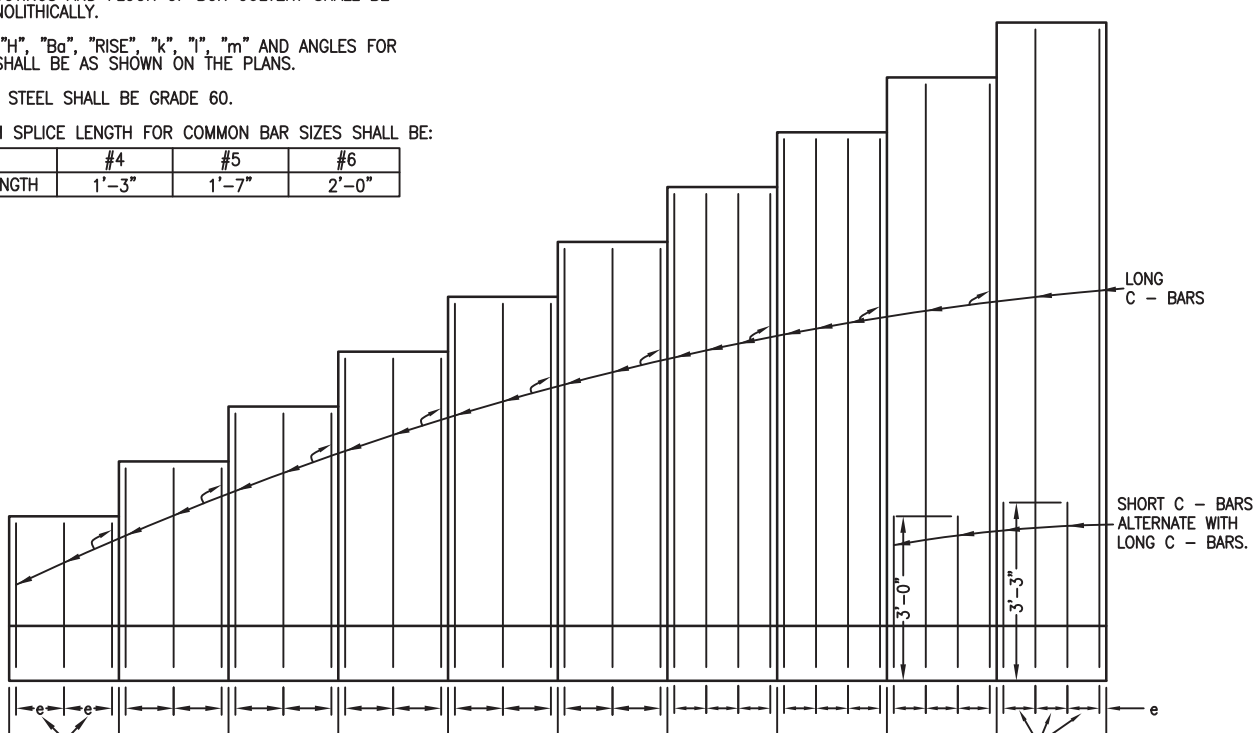
Revised:

Drawing No.
SP.50b

GENERAL NOTES

1. ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾".
2. WINGWALL FOOTINGS AND FLOOR OF BOX CULVERT SHALL BE POURED MONOLITHICALLY.
3. DIMENSIONS "H", "Ba", "RISE", "k", "l", "m" AND ANGLES FOR WINGWALLS SHALL BE AS SHOWN ON THE PLANS.
4. REINFORCING STEEL SHALL BE GRADE 60.
5. THE MINIMUM SPLICE LENGTH FOR COMMON BAR SIZES SHALL BE:

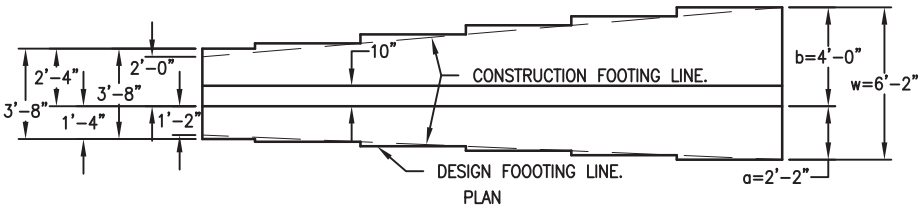
BAR	#4	#5	#6
SPLICE LENGTH	1'–3"	1'–7"	2'–0"



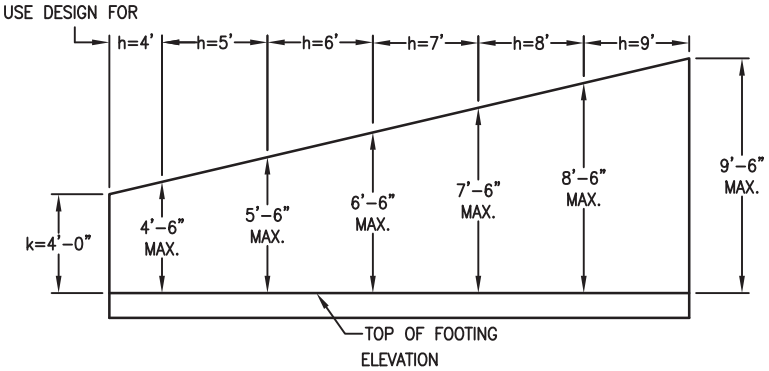
e =	1'–6"	1'–6"	1'–6"	1'–6"	1'–6"	1'–4"	1'–3"	11"	9"	7" CTRS.
h =	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'
a =	1'–0"	1'–2'	1'–4"	1'–6'	1'–8"	1'–10"	2'–0"	2'–2"	2'–4"	2'–6"
b =	1'–8"	2'–0"	2'–4'	2'–8'	3'–0"	3'–4"	3'–8"	4'–0"	4'–4"	4'–8"
w =	2'–8"	3'–2"	3'–8"	4'–2"	4'–8"	5'–2"	5'–8"	6'–2"	6'–8"	7'–2"
c & d BARS	#4@1'–6"	#4@1'–6"	#4@1'–6"	#4@1'–6"	#4@1'–6"	#4@1'–4"	#5@1'–3"	#5@11"	#6@9"	#6@7" CTRS.
*CONC.CU.YD./L.F.	0.161	0.210	0.259	0.308	0.358	0.407	0.457	0.506	0.556	0.604
*REINF. LB./L.F.	8.0	9.3	10.7	12.1	14.3	16.4	23.0	28.6	41.8	54.6

*DOES NOT INCLUDE TOE WALL QUANTITIES

DESIGN TABLE



PLAN



DESIGN EXAMPLE

REFERENCE:

CDOT M & S STANDARDS
M-601-20

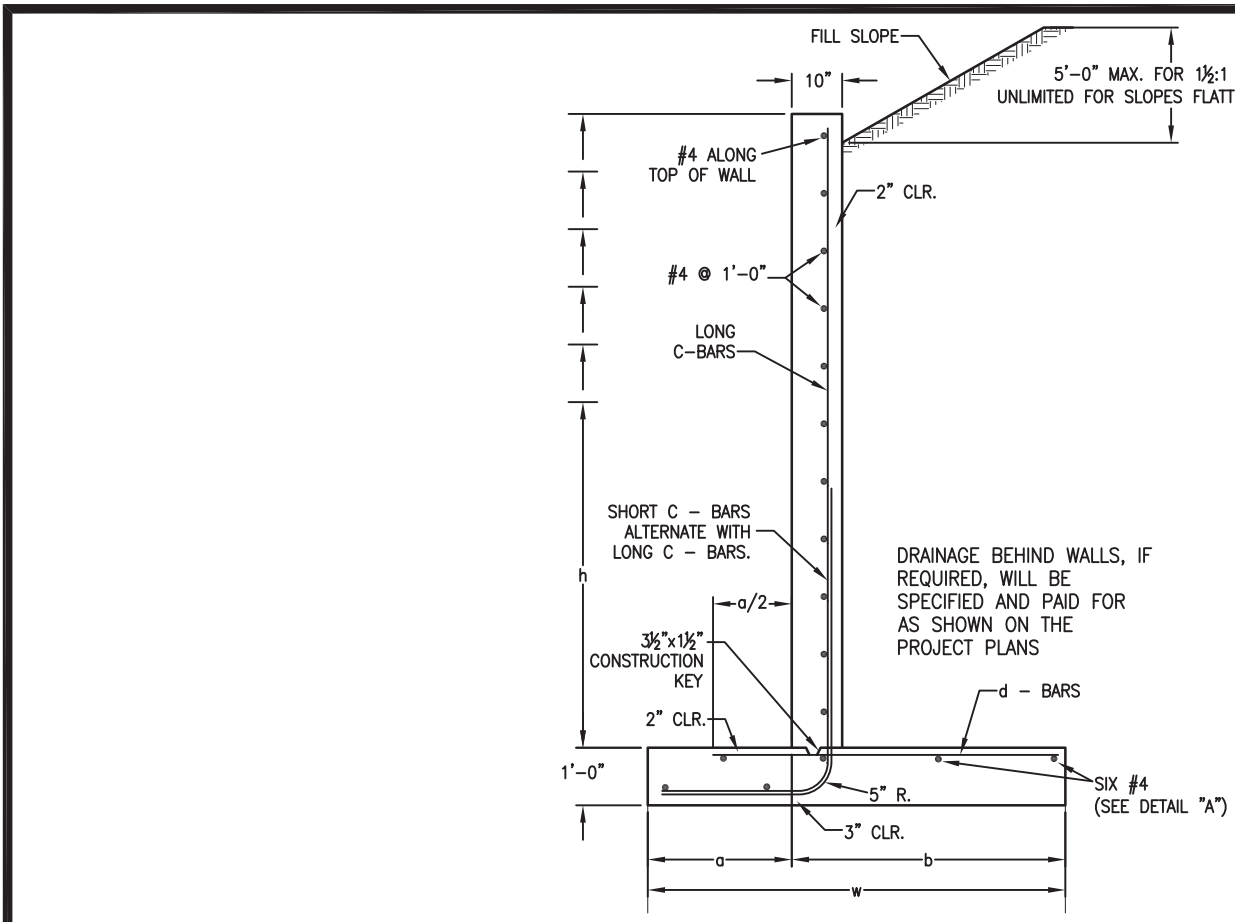
WINGWALLS

DOUGLAS COUNTY
COLORADO

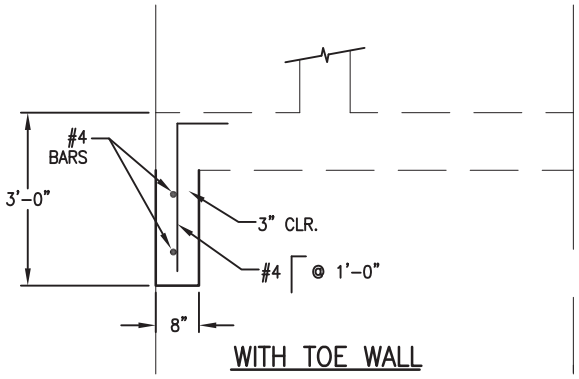
Issued: 05/2013

Revised:

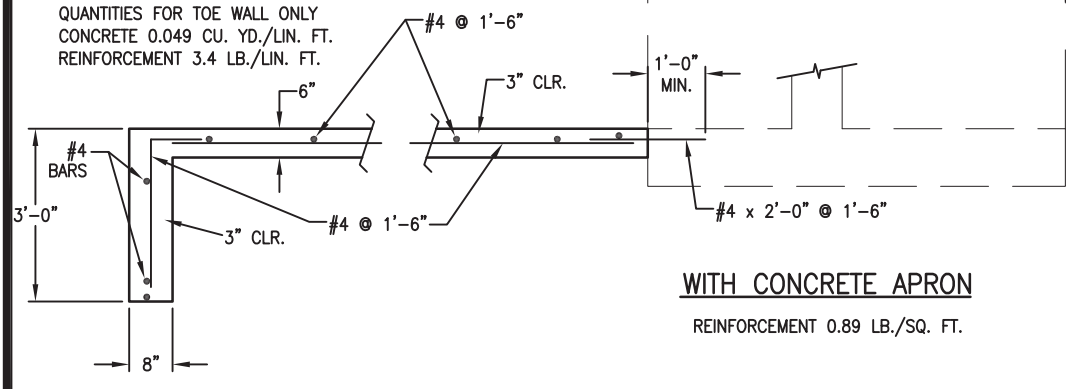
Drawing No.
SP.51a



TYPICAL SECTION



WITH TOE WALL



WITH CONCRETE APRON

REINFORCEMENT 0.89 LB./SQ. FT.

APRON
TOE WALL

REFERENCE:

CDOT M & S STANDARDS
M-601-20

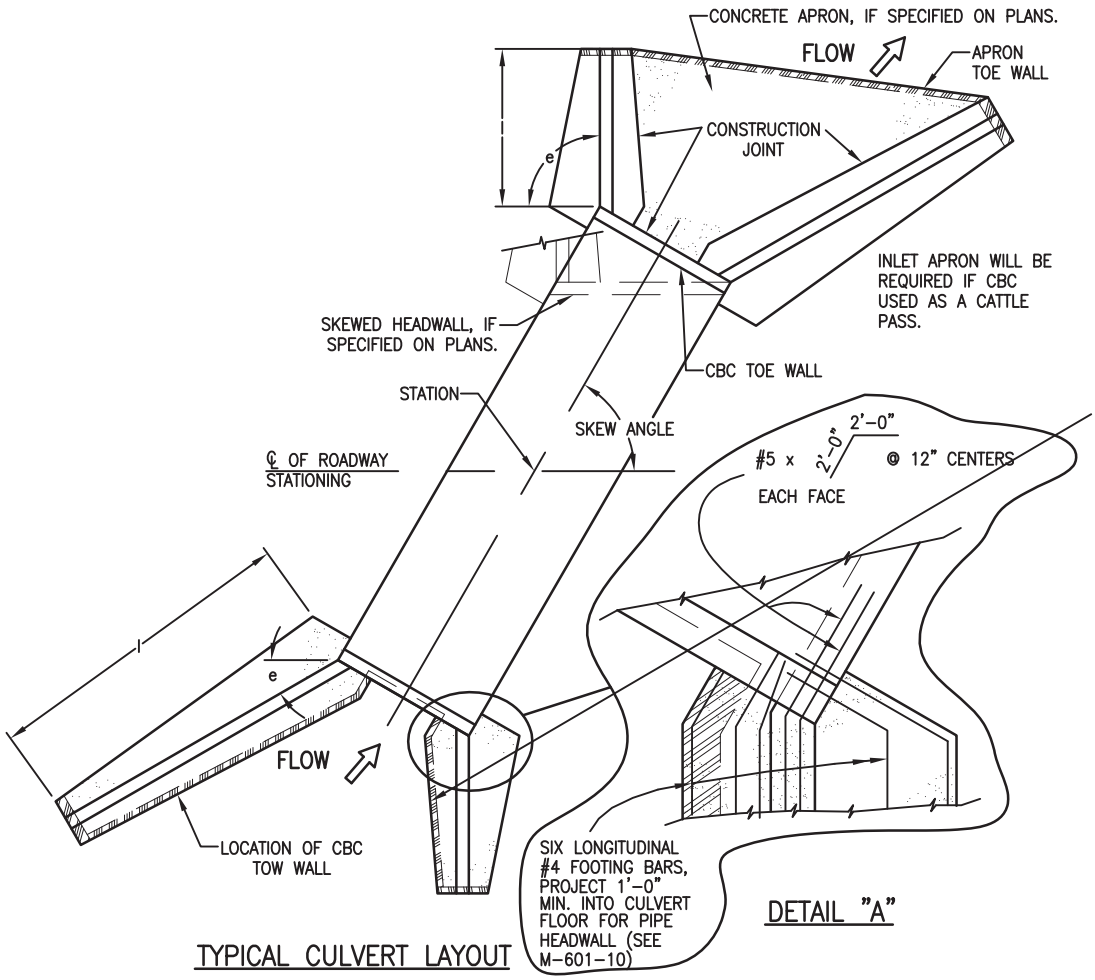
WINGWALLS

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised: _____

Drawing No.
SP.51b



TYPICAL CULVERT LAYOUT

DESIGN DATA:
UNIT STRESSES: f_s = 24,000 PSI
f_c = 1,200 PSI
n = 9

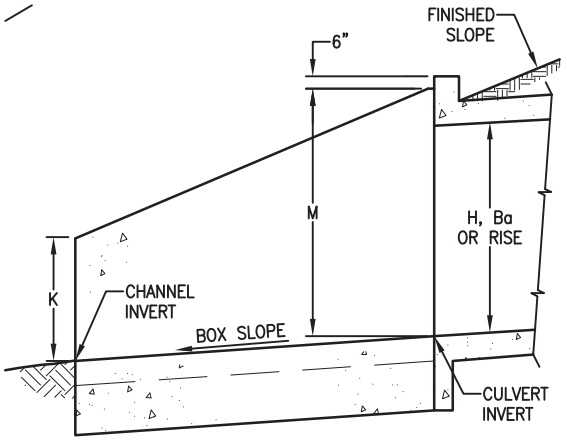
EQUIVALENT FLUID PRESSURE = 36 LBS./CU. FT.
MAXIMUM TOE PRESSURE = 1 TON/SQ. FT.

ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE CONCRETE IS POURED.

WINGWALL AND APRON CONCRETE SHALL BE:
CONCRETE CLASS D (BOX CULVERT) FOR CBC's.
CONCRETE CLASS D (WALL) FOR PIPES.

LIVE LOAD SURCHARGE HAS NOT BEEN CONSIDERED. WALLS WITHIN $h/_2$ OF THE EDGE OF THE ROADWAY SHOULDER WILL REQUIRE A SPECIAL DESIGN IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES.

APRON REQUIRED AT INLET OF THE CBC, IF USED FOR WILDLIFE PASSAGE OR PEDESTRIAN CROSSING.



BOX ELEVATION

M = H, Ba OR RISE + (1'-4")
UNLESS OTHERWISE SHOWN ON PLANS.

REFERENCE:

CDOT M & S STANDARDS
M-601-20

WINGWALLS

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised:

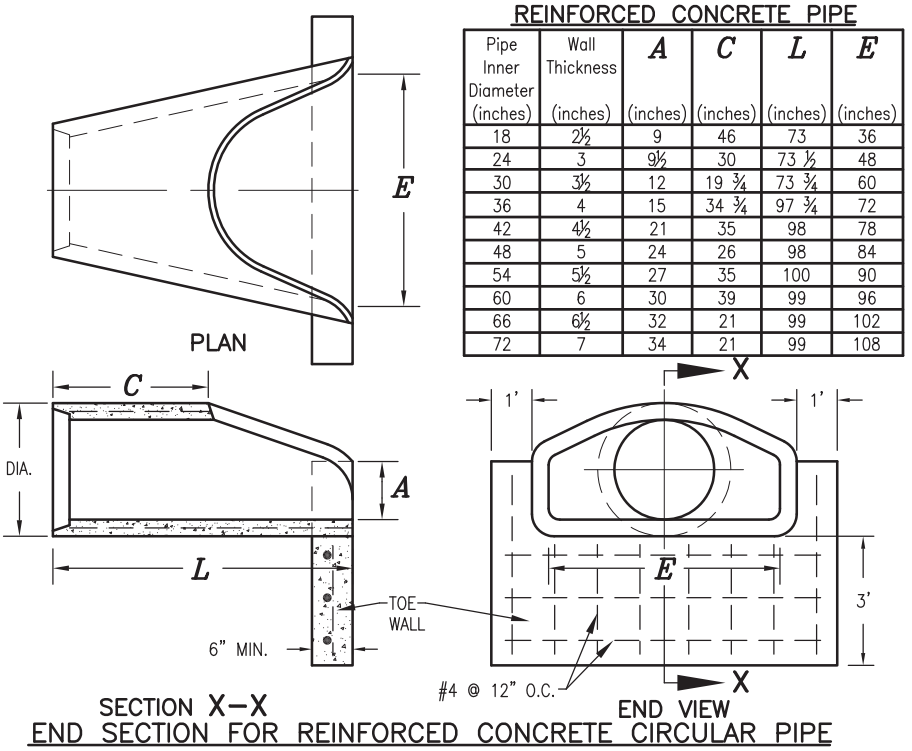
Drawing No.
SP.51c

GENERAL NOTES

1. DIMENSIONS OF END SECTIONS MAY VARY SLIGHTLY FROM THOSE SHOWN ON THE TABLES DUE TO DIFFERENT MANUFACTURER'S VARIATIONS.
2. CONCRETE END SECTIONS ARE TO BE FURNISHED WITH TONGUE OR GROOVE AS REQUIRED.
3. DESIGN LENGTH OF CULVERT OR SIDE DRAIN IS BASED ON LENGTH OF END SECTION SHOWN IN TABLE. ANY ADDITIONAL PIPE REQUIRED TO PROVIDE THE DESIGN LENGTH SHALL BE FURNISHED BY AND AT THE EXPENSE OF THE CONTRACTOR.
4. INSIDE CONFIGURATION AND JOINT OF CONCRETE END SECTION END PIPE SHALL MATCH.
5. END SECTIONS FOR CMP ARCH CULVERT SHALL MATCH THE DIMENSIONS OF THE CULVERT SHOWN ON THE PLANS.
6. GALVANIZED TOE PLATE AS SHOWN, WILL BE REQUIRED ON END SECTIONS FOR CORRUGATED STEEL PIPE AND SHALL BE THE SAME THICKNESS AS END SECTIONS. TOE PLATE SHALL BE FIELD–BOLTED TO END SECTION WITH ⅜" GALVANIZED BOLTS, NUTS AND WASHERS.
7. GALVANIZED STEEL SHALL BE IN CONFORMANCE WITH AASHTO M 111, M 218 OR M 232.
8. FOR TYPE SD END SECTIONS, BARS SHALL BE FABRICATED FROM NPS–3 GALVANIZED STEEL SCHEDULE 40 PIPE WHICH SHALL BE IN CONFORMANCE WITH ASTM A 53.
9. FOR A TYPE SD END SECTION, THE INSTALLATION OF ALTERNATIVE 1 OR ALTERNATIVE 2 END SECTION SHALL BE THE CONTRACTOR'S OPTION.
10. CONCRETE PIPE JOINT FASTENERS SHALL BE INSTALLED AT THE FLARED END SECTION AND LAST TWO PIPE JOINTS OF ALL RCP OUTFALLS.
11. CONNECTIONS OF METAL END SECTIONS TO PLASTIC PIPE SHALL BE APPROVED BY THE ENGINEER.
12. CLASS D CONCRETE TOE WALLS ARE REQUIRED AT THE ENDS OF ALL FLARED END SECTIONS.

REINFORCED CONCRETE PIPE

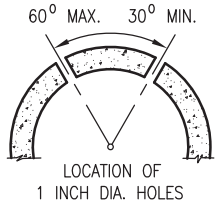
Pipe Inner Diameter (inches)	Wall Thickness (inches)	*A* (inches)	*C* (inches)	*L* (inches)	*E* (inches)
18	2½	9	46	73	36
24	3	9½	30	73 ½	48
30	3½	12	19 ¾	73 ¾	60
36	4	15	34 ¾	97 ¾	72
42	4½	21	35	98	78
48	5	24	26	98	84
54	5½	27	35	100	90
60	6	30	39	99	96
66	6½	32	21	99	102
72	7	34	21	99	108

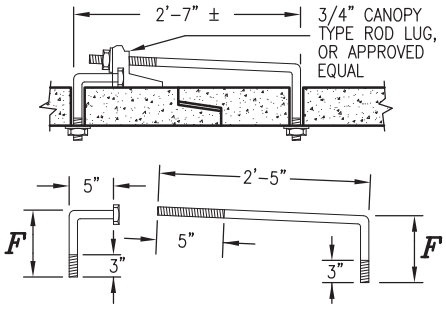


END SECTION FOR REINFORCED CONCRETE CIRCULAR PIPE

3/4 INCH GALVANIZED ANCHOR BOLTS, NUTS AND WASHERS, MILD STEEL, ASTM A 307. ROD LUG SHALL BE COATED WITH COAL–TAR, EPOXY PAINT OR APPROVED EQUAL.

PIPE DIAMETER (inches)	*F*
18 – 30	5
36 – 42	6
48 – 60	7
72 – 84	9





CONCRETE JOINT FASTENER (TWO PER JOINT)

REFERENCE:

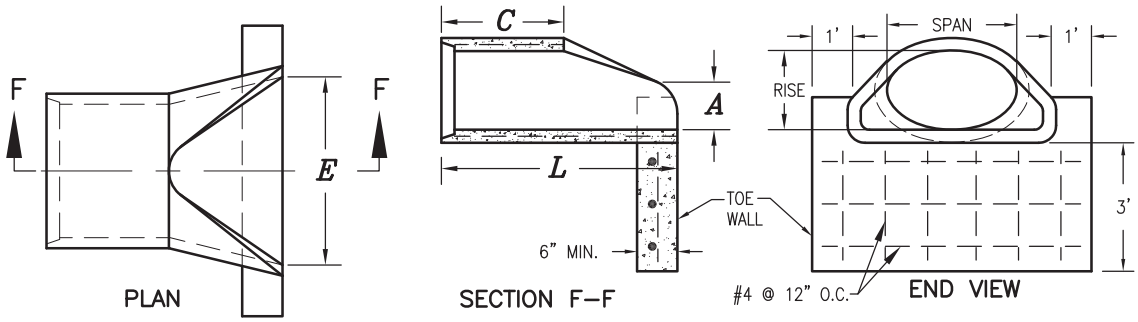
CDOT M & S STANDARDS
M–603–10

CONCRETE OR METAL END SECTIONS

DOUGLAS COUNTY
COLORADO

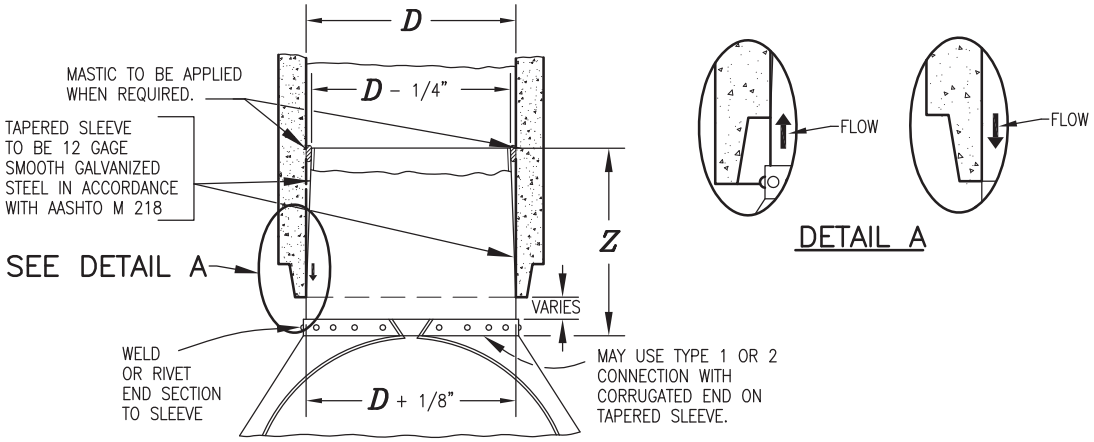
Issued: 05/2013
Revised: 09/2017

Drawing No.
SP.52a



EQUIVALENT CIRCULAR DIA.	DIMENSIONS					
	NOMINAL SPAN x RISE		*A*	*C*	*L*	*E*
	(inches)					
24	30	19	9	33	72	48
30	38	24	10	18	72	60
36	45	29	12	24	84	72
42	53	34	16	36	96	78
48	60	38	21	36	96	84
54	68	43	26	36	96	90
60	76	48	30	36	96	96

END SECTION FOR REINFORCED CONCRETE ELLIPTICAL PIPE



D	*Z* (MIN.)
(INCHES)	
18 – 24	12
30 & 36	16
42 & LARGER	24

NOTE: METAL END SECTION TO BE FIRMLY WEDGED INTO PIPE END BEFORE BACKFILLING

STEEL END SECTION FOR CONCRETE PIPE

(ALTERNATIVE FOR CONCRETE END SECTION)

REFERENCE:

CDOT M & S STANDARDS
M-603-10

CONCRETE OR METAL END SECTIONS

DOUGLAS COUNTY
COLORADO

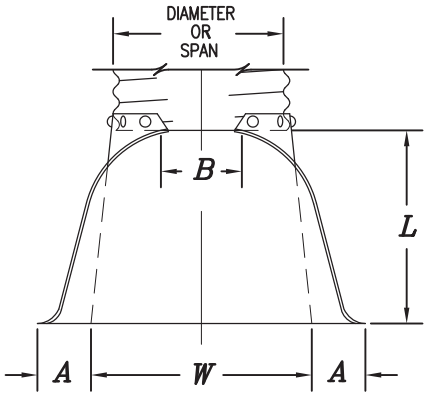
Issued: 05/2013

Revised: 09/2017

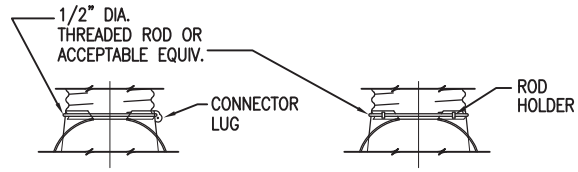
Drawing No.
SP.52b

THIN–WALL ROUND PIPE

PIPE DIA.	THICKNESS	DIMENSIONS					
		A	B	H	L	W	T
		(inches)					
15	0.064	6	6	6	21	24	34
18	0.064	8	10	6	31	36	46
21	0.064	9	12	6	36	42	52
24	0.064	10	13	6	41	48	58
30	0.079	12	16	8	51	60	70
36	0.079	14	19	9	60	72	94
42	0.109	16	22	11	69	84	106
48	0.109	18	27	12	78	90	112
54	0.109	18	30	12	84	102	124
60	0.109	18	33	12	87	114	136
66	0.109	18	36	12	87	120	142
72	0.109	18	39	12	87	126	148
78	0.109	18	42	12	87	132	154
84	0.109	18	45	12	87	138	160



PLAN

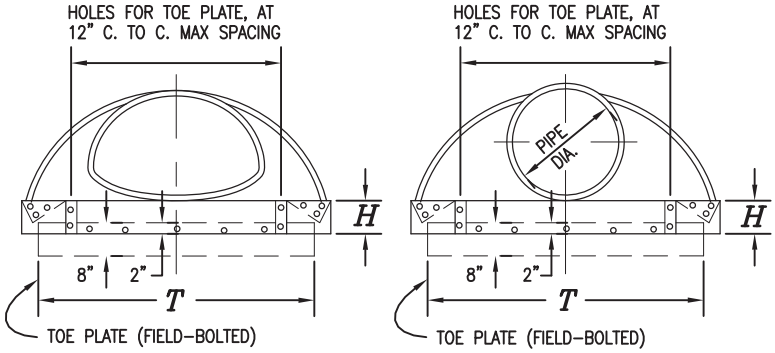


TYPE 1
FOR 18 IN. THRU 24 IN. ROUND PIPE WITH ANNULAR CORRUGATIONS. NOT TO BE USED ON HELICALLY–FORMED PIPE UNLESS RECORRUGATED.

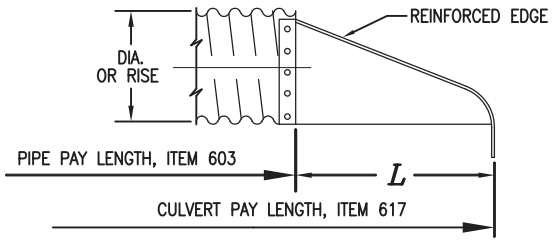
TYPE 2
FOR 30 IN. THRU 36 IN. ROUND PIPE WITH ANNULAR CORRUGATIONS. NOT TO BE USED ON HELICALLY–FORMED PIPE UNLESS RECORRUGATED.

TYPE 3
FOR 42 IN.THRU 84 IN. ROUND PIPE WITH ANNULAR CORRUGATIONS AND ALL SIZES WITH HELICAL CORRUGATIONS AND FOR ALL METAL PIPE ARCH CULVERTS. SHOP ATTACH A 24 IN. MIN. LENGTH OF ANNULAR PIPE WITH GALV. RIVETS OR BOLTS, SPOT WELDS, OR 2 IN. LONG SKIP WELDS ON 8 IN. CTRS. REPAIR BURNT GALV. PER SPECS.

TYPICAL CONNECTIONS



ELEVATIONS



THIN–WALL PIPE ARCH

PIPE ARCH SPAN x RISE	THICK–NESS	DIMENSIONS					
		A	B	H	L	W	T
		(1"±)	(Max.)	(1"±)	(1.5"±)	(2"±)	
		(inches)					
21 x 15	0.064	7	10	6	23	36	46
24 x 18	0.064	8	12	6	28	42	52
28 x 20	0.064	9	14	6	32	48	58
35 x 24	0.079	10	16	6	39	60	70
42 x 29	0.079	12	18	8	46	75	85
49 x 33	0.109	13	21	9	53	85	103
57 x 38	0.109	18	26	12	63	90	108
64 x 43	0.109	18	30	12	70	102	120
71 x 47	0.109	18	33	12	77	114	132

END SECTION AND CONNECTION DETAILS FOR ROUND AND ARCH CORRUGATED METAL PIPE CULVERTS

REFERENCE:

CDOT M & S STANDARDS
M–603–10

CONCRETE OR METAL END SECTIONS

DOUGLAS COUNTY
COLORADO

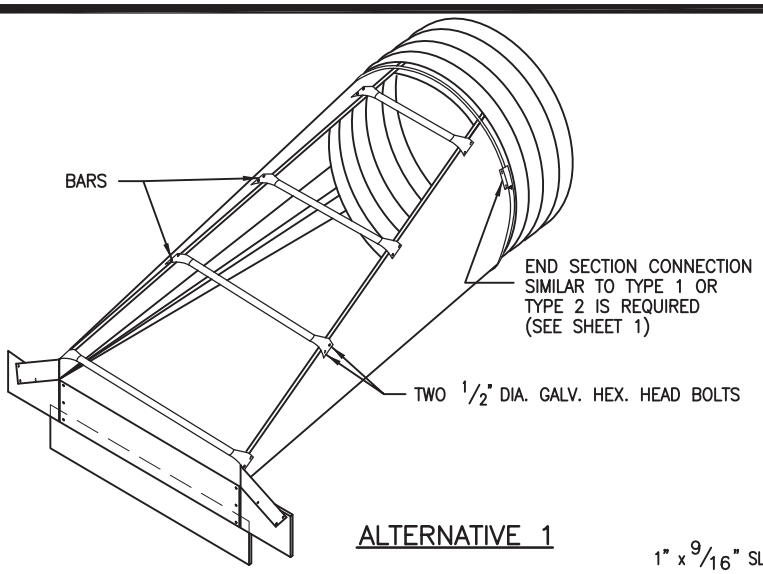
Issued: 05/2013

Revised:

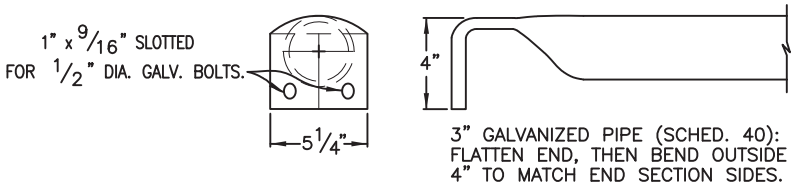
Drawing No.
SP.52c

END SECTIONS FOR CIRCULAR PIPES

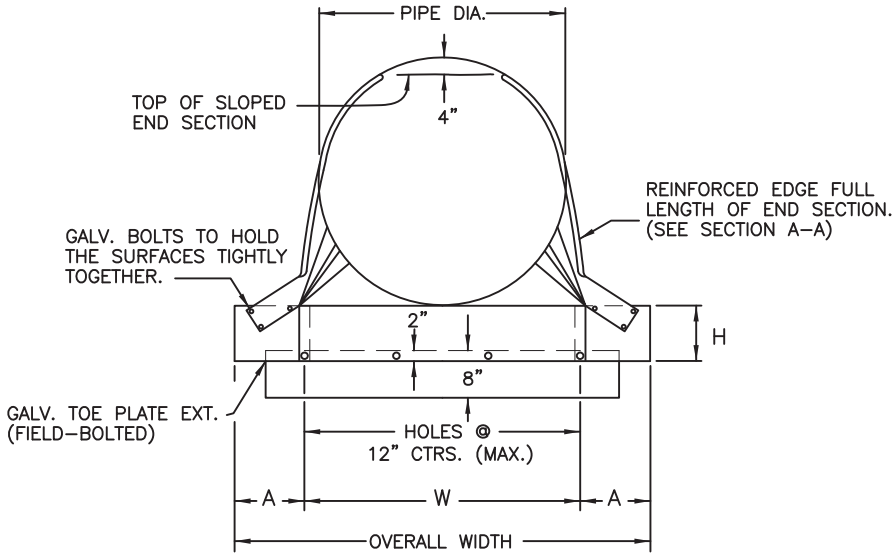
PIPE DIA. (in.)	MIN. THICK (in.)	DIMENSION (INCHES)					
		A	H	W	OVERALL WIDTH	SLOPE	LENGTH L
15	.064	8	6	21	37	6:1	30
18	.064	8	6	24	40	6:1	48
21	.064	8	6	27	43	6:1	66
24	.079	8	6	30	46	6:1	84
30	.079	12	9	36	60	6:1	120
36	.109	12	9	42	66	6:1	156



ALTERNATIVE 1

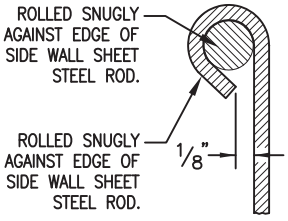


BAR END DETAILS
(FOR ALTERNATIVE 1)

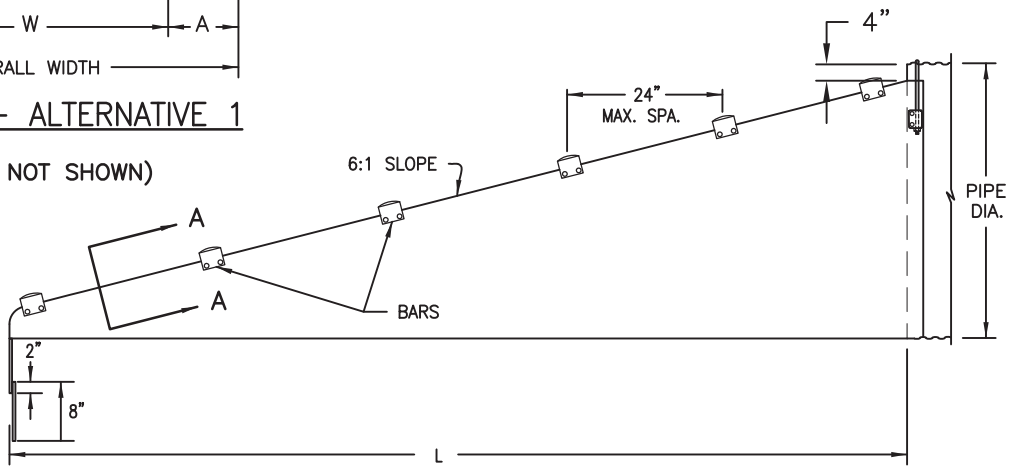


FRONT VIEW – ALTERNATIVE 1

(BARS NOT SHOWN)



SECTION A–A



SIDE VIEW OF END SECTION – ALTERNATIVE 1

TYPE SD END SECTIONS FOR SIDE DRAIN

REFERENCE:

CDOT M & S STANDARDS
M-603-10

CONCRETE OR METAL END SECTIONS

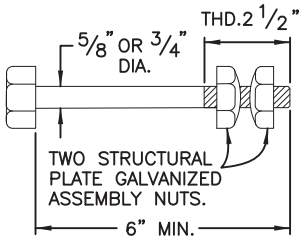
DOUGLAS COUNTY
COLORADO

Issued: 05/2013

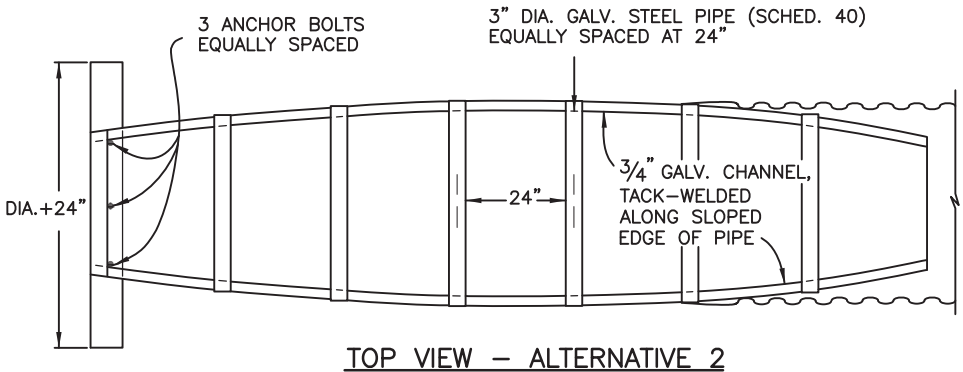
Revised:

Drawing No.
SP.52d

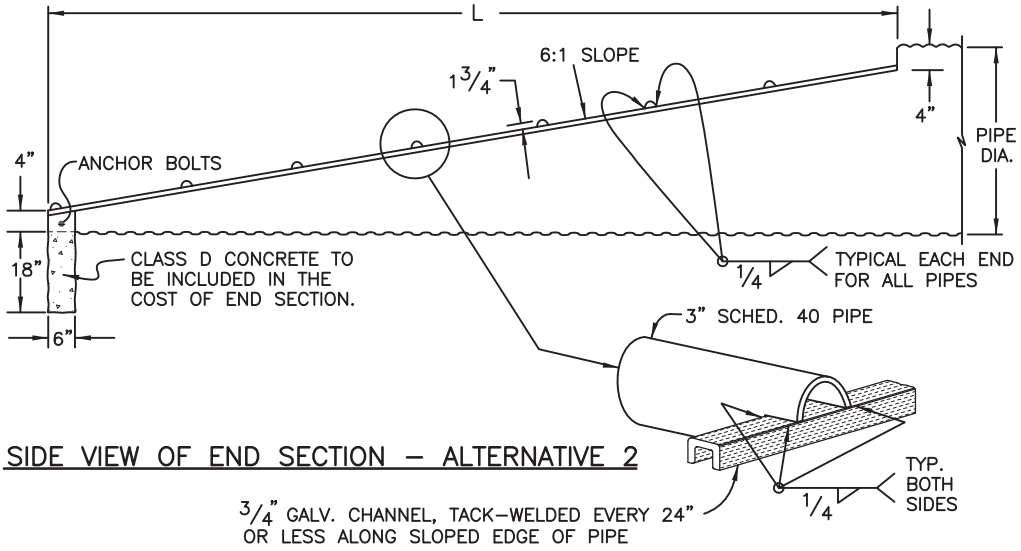
NOTE:
ALL CUT AND/OR WELDED SURFACES
TO BE PROTECTED WITH ONE FULL BRUSH COAT
OF ZINC RICH PAINT PER 707.09.



TYPICAL ANCHOR BOLT
(GALVANIZED)



TOP VIEW – ALTERNATIVE 2



SIDE VIEW OF END SECTION – ALTERNATIVE 2

BAR END DETAIL
(FOR ALTERNATIVE 2)

TYPE SD END SECTIONS FOR SIDE DRAIN

REFERENCE:

CDOT M & S STANDARDS
M-603-10

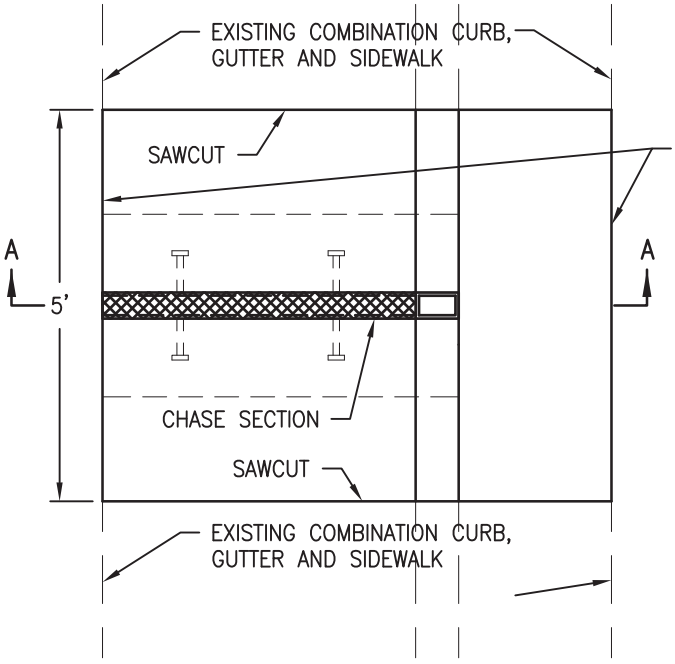
CONCRETE OR METAL END SECTIONS

DOUGLAS COUNTY
COLORADO

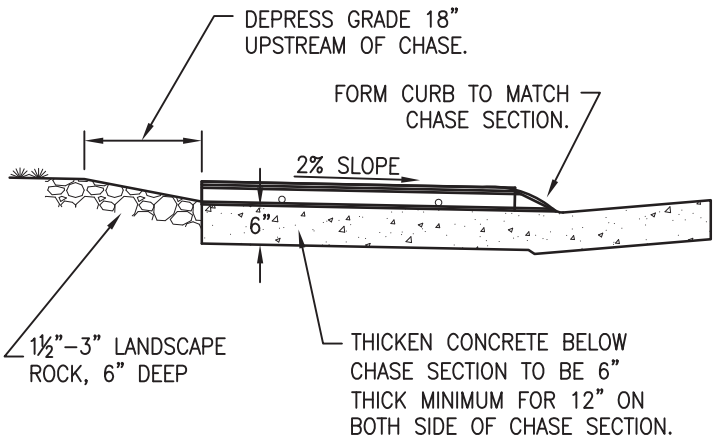
Issued: 05/2013

Revised:

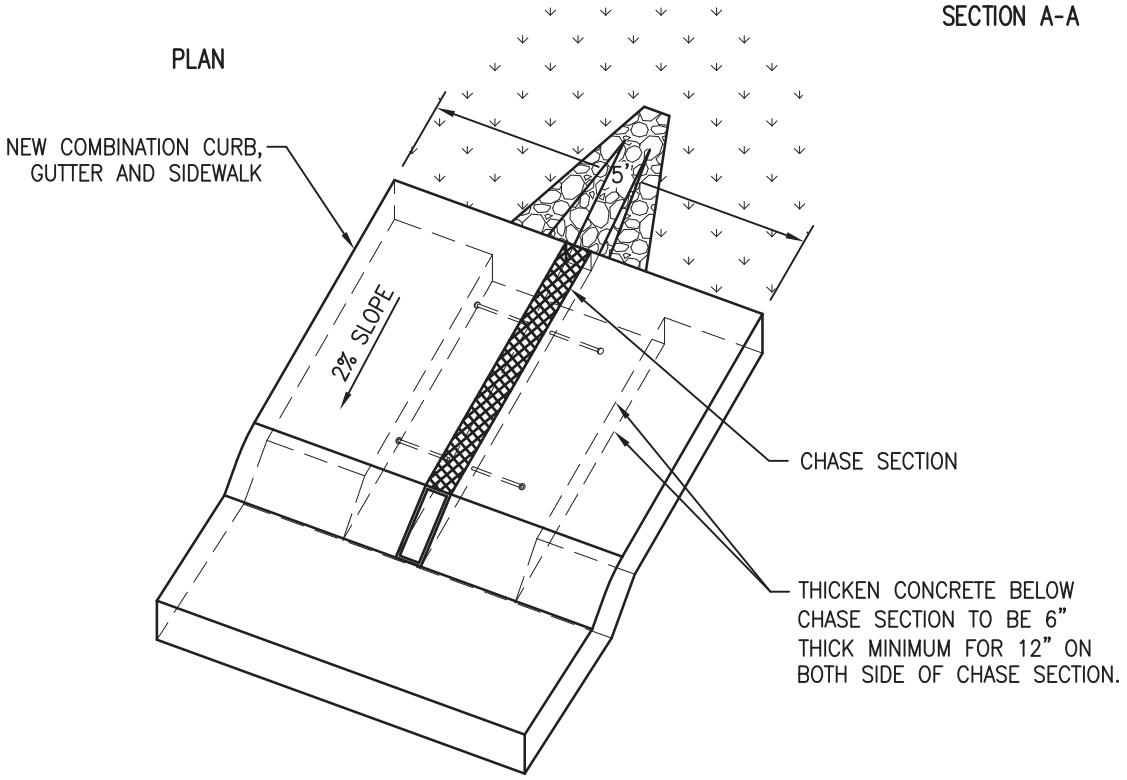
Drawing No.
SP.52e



PLAN



SECTION A-A



ISOMETRIC VIEW

NOTES:

1. SAWCUT ALL AREAS TO RECEIVE CHASE SECTION.
2. THE USE OF THIS DETAIL MUST BE PREAPPROVED BY DOUGLAS COUNTY ENGINEERING DIVISION PRIOR TO CONSTRUCTION IN R.O.W.
3. **DIRECT CONNECTION TO YARD PIPES WILL NOT BE ALLOWED.**
4. CHASE DRAIN SHALL BE LOCATED 2.5' MIN. FROM PROPERTY LINE.

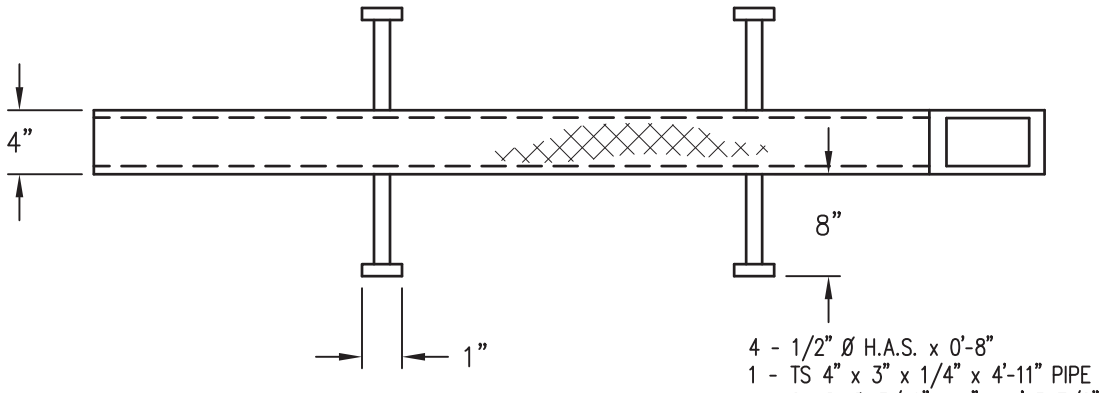
RESIDENTIAL SIDEWALK CURB CHASE PLAN

DOUGLAS COUNTY COLORADO

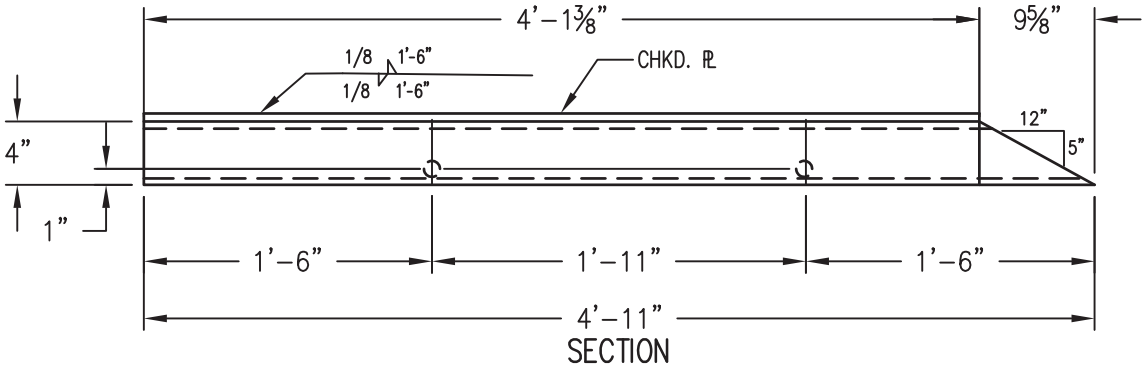
Issued: 05/2013

Revised: _____

Drawing No. **SP.53a**



PLAN



SECTION

GALV. AFTER FAB.
M 111-68 / A 123-68

RESIDENTIAL SIDEWALK CURB CHASE DETAIL

DOUGLAS COUNTY
COLORADO

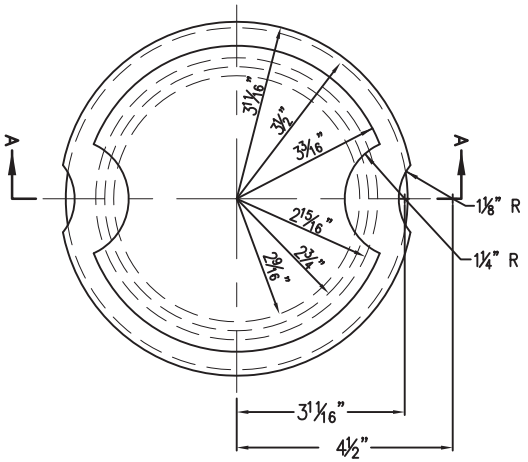
Issued: 05/2013

Revised:

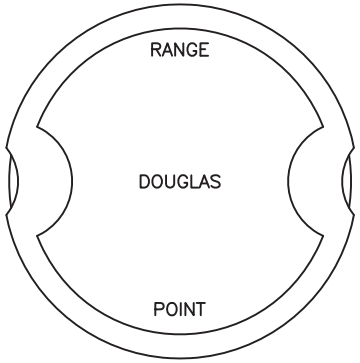
Drawing No.
SP.53b

RANGE BOX

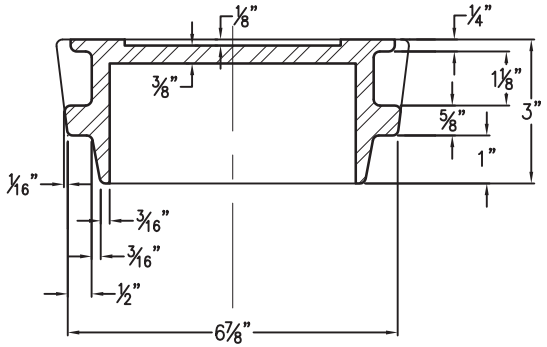
DOUGLAS COUNTY
COLORADO



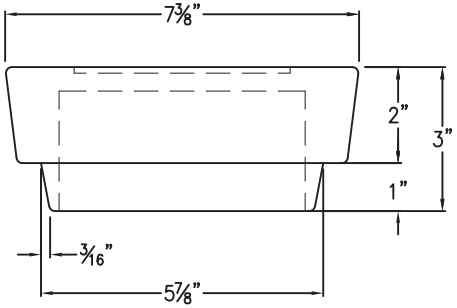
TOP



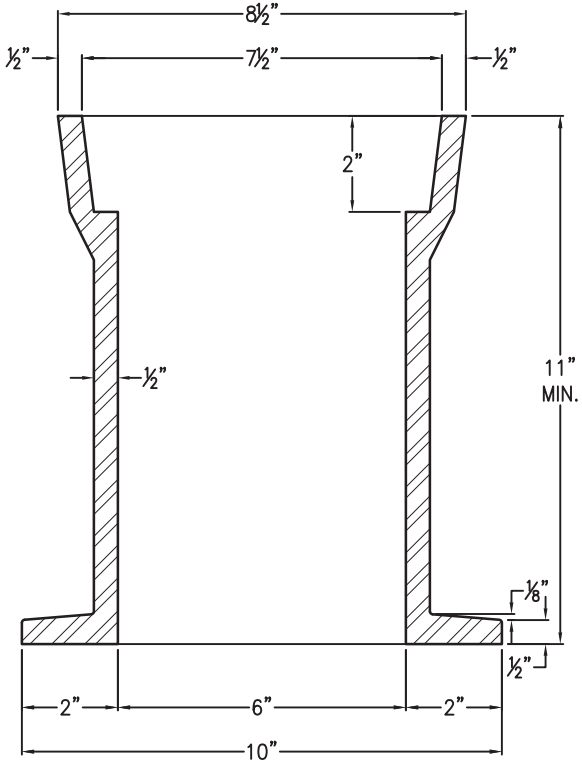
REQUIRED LETTERING FOR
BOX COVER



SECTION A–A



SIDE



NOTES

LETTERS SHALL BE NOT LESS THAN 5/8"
HIGH & RAISED 1/8" ABOVE SURFACE.

ALL FILLETS & ROUNDS RADII = 1/8".

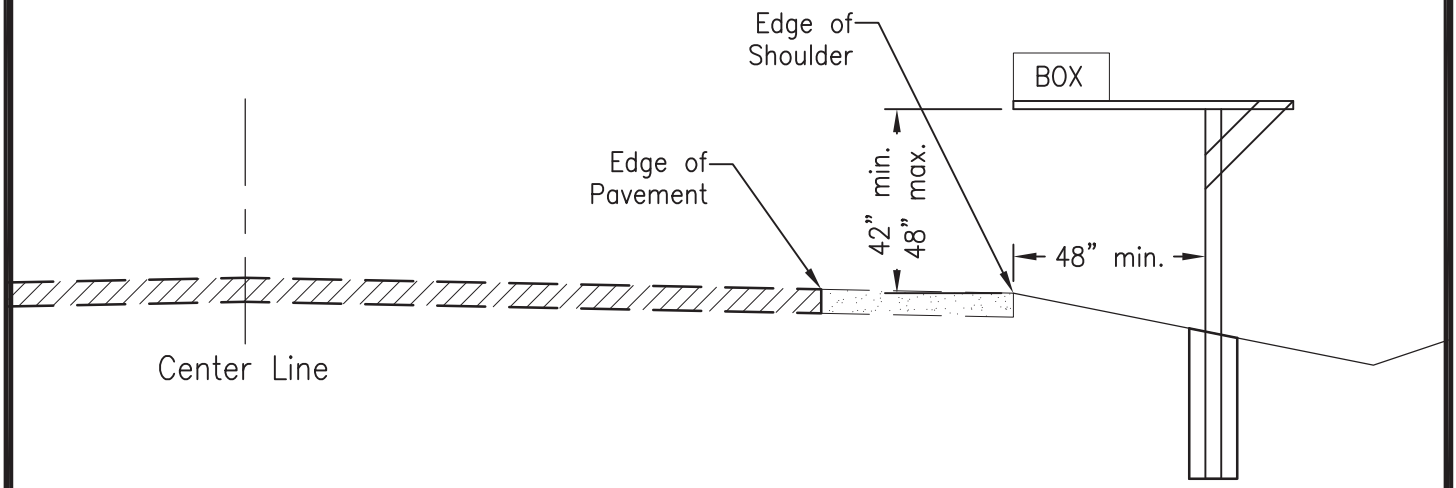
Issued: 05/2013
Revised:

Drawing No.
SP.54

NOTICE

Recommended Mailbox Installations

To avoid damage to your mailbox and also allow the snowplows to remove the snow from under your mailbox, the following dimensions are recommended.



Placing mailboxes a short distance away from driveways and intersections helps to avoid vision–restricting snowbanks and also damage to your mailbox. The box and base should be strong enough to withstand flying snow and slush from traffic and snowplows.

REFERENCE:	**MAILBOX SUPPORT**	Issued: 05/2013
	DOUGLAS COUNTY COLORADO	Revised:
		Drawing No. **SP.55a**

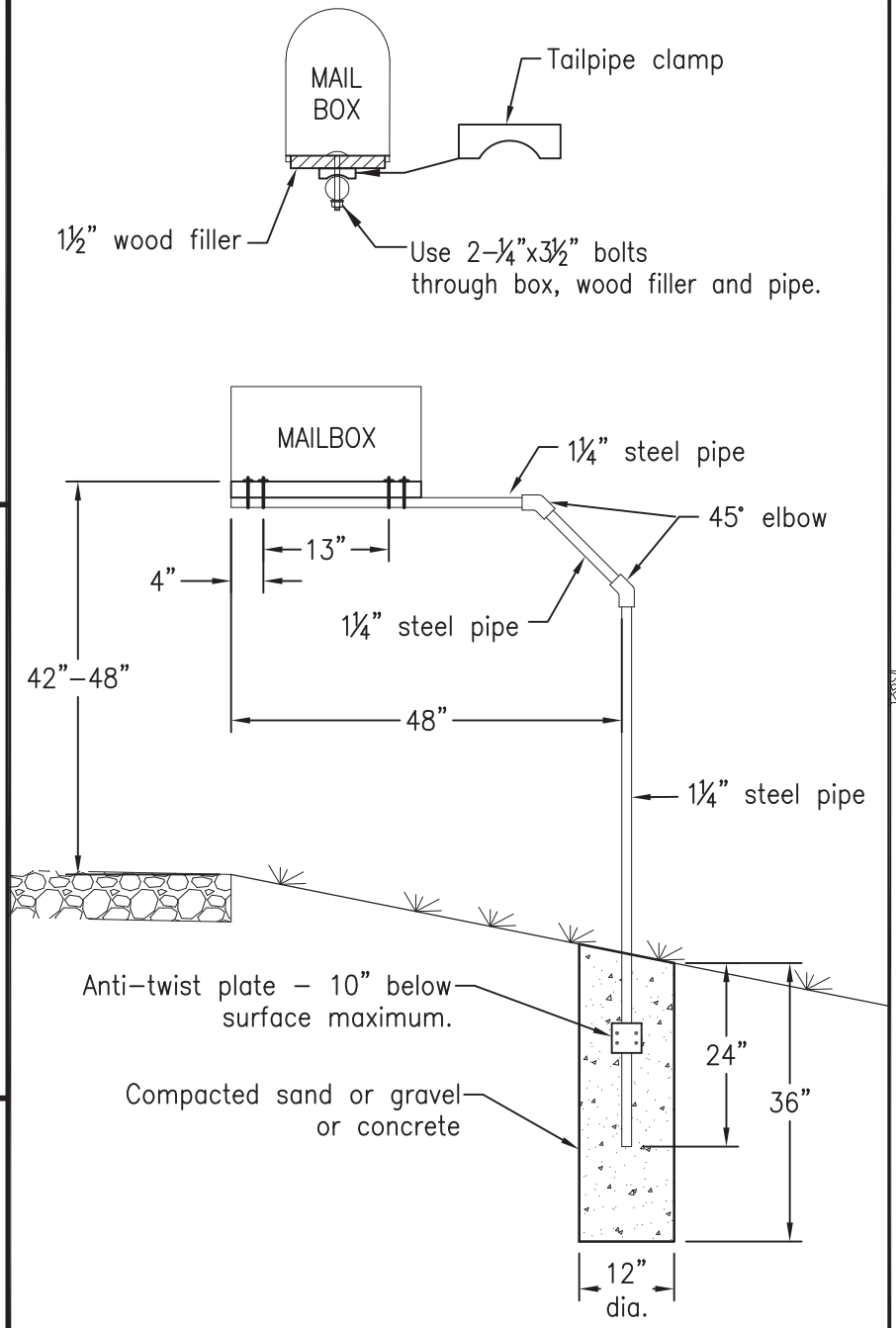
REFERENCE:

DOUGLAS COUNTY
COLORADO

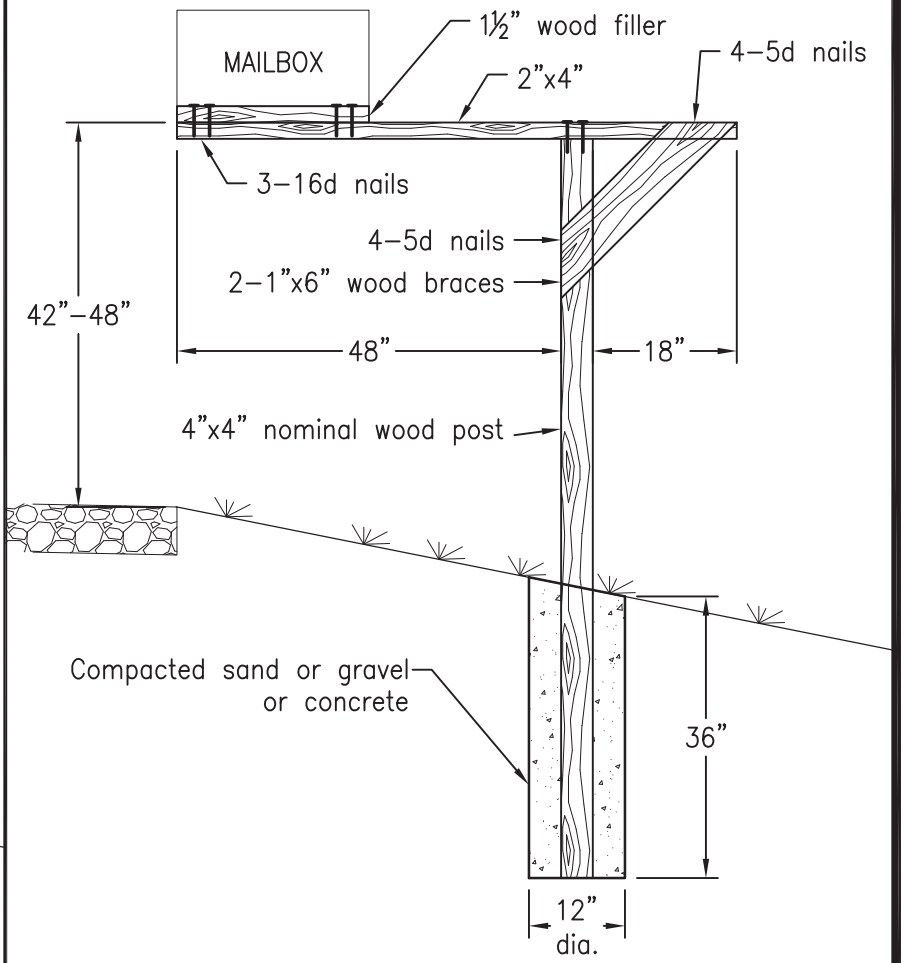
MAILBOX SUPPORT

Drawing No.
SP.55b

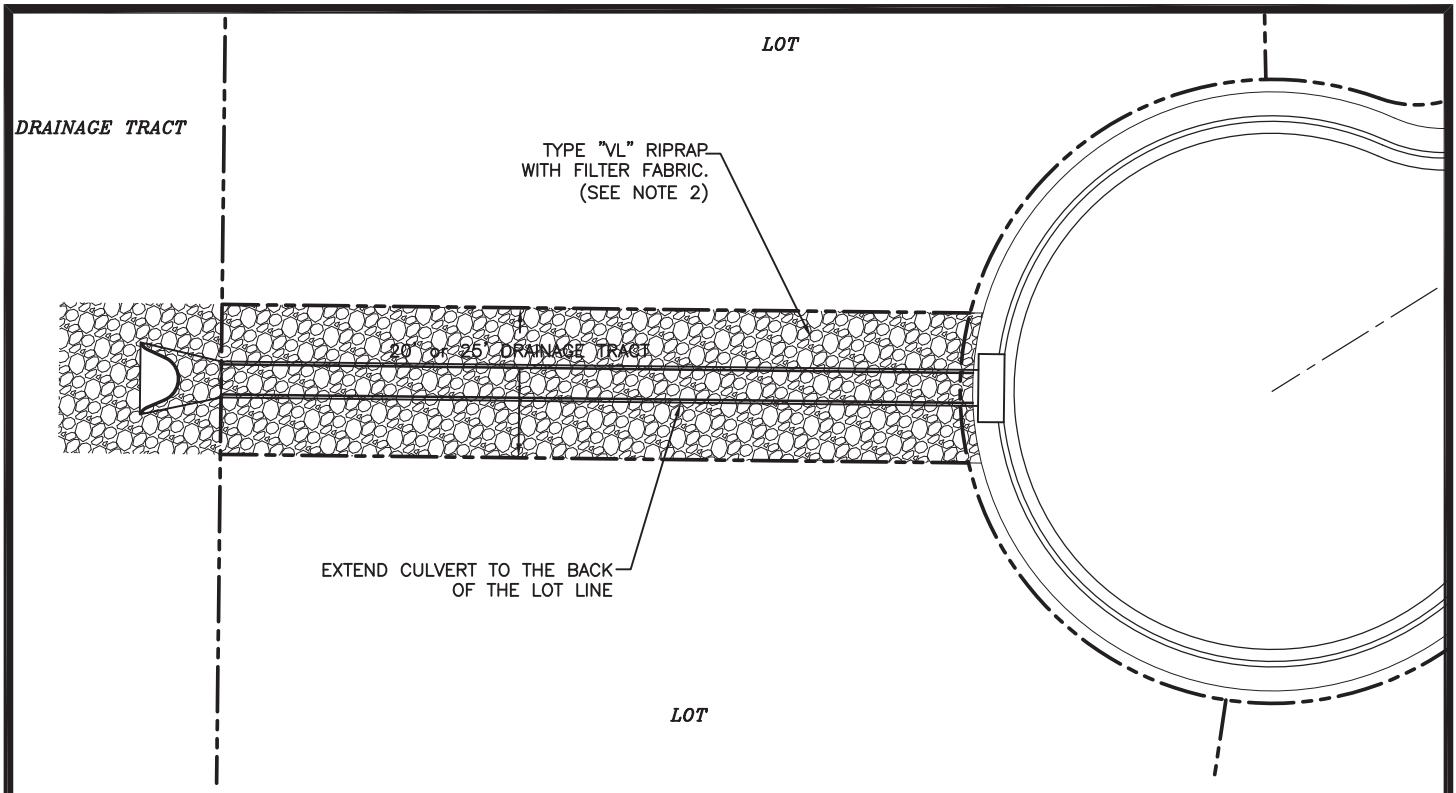
Issued: 05/2013
Revised: _____

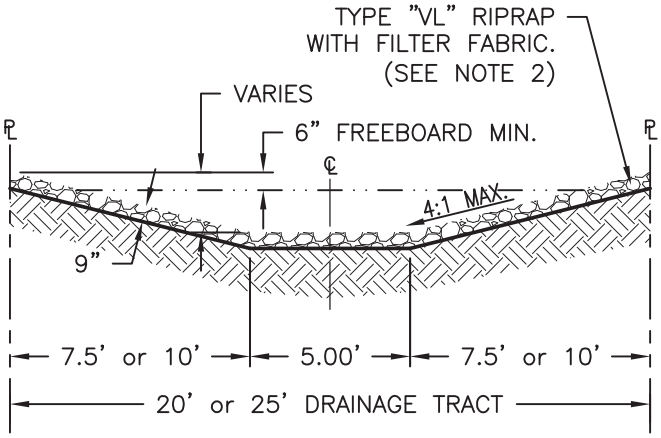


STEEL PIPE CANTILEVER MAILBOX SUPPORT

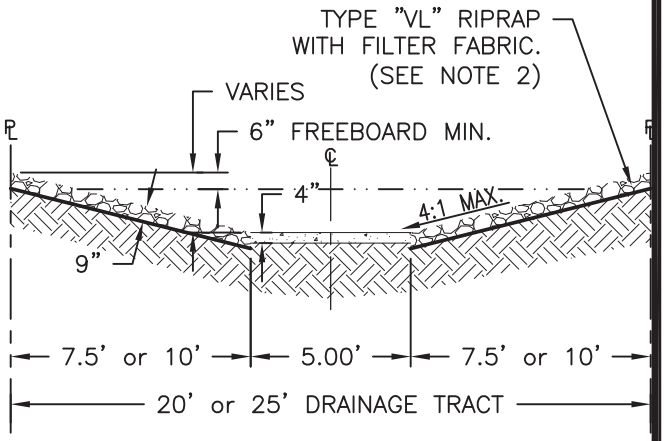


WOOD CANTILEVER MAILBOX SUPPORT





TYPICAL CROSS SECTION



CROSS SECTION WITH OPTIONAL SIDEWALK
(SEE NOTE 1)

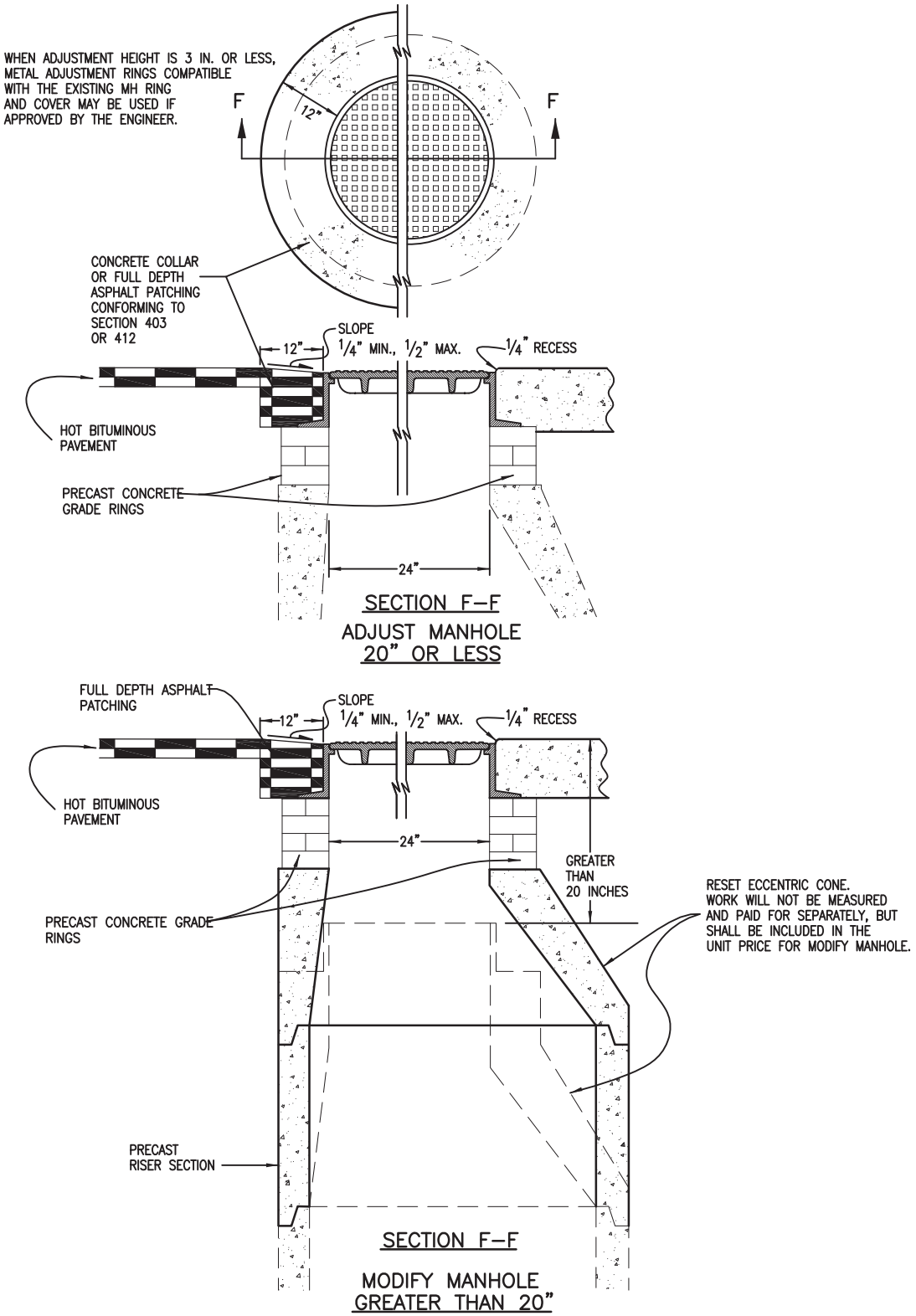
NOTES:
1. OPTIONAL 4" CONCRETE SIDEWALK MAY BE USED ONLY WITH THE DISTRICT'S APPROVAL.
2. FILTER FABRIC IS TARABOND #1112-12-4 OR EQUIVALENT.
3. LONGITUDINAL SLOPE SPECIFICATION, MIN. 2%, MAX. 25%.

EMERGENCY OVERFLOW CHANNEL (IN DRAINAGE TRACT)

DOUGLAS COUNTY
COLORADO

Issued: 05/2013
Revised:

Drawing No.
SP.56



NOTES:

1. ADEQUATE BARRICADES SHALL BE PLACED AND MAINTAINED UNTIL THE COLLAR ATTAINS A COMPRESSIVE STRENGTH OF 4500 PSI.
2. MANHOLES SHALL NOT BE LOCATED IN CROSSPANS OR GUTTERS.
3. MANHOLE RIM AND COVER SHALL MATCH ROADWAY SLOPE.

MANHOLE RING AND COVER ADJUSTMENT

DOUGLAS COUNTY COLORADO

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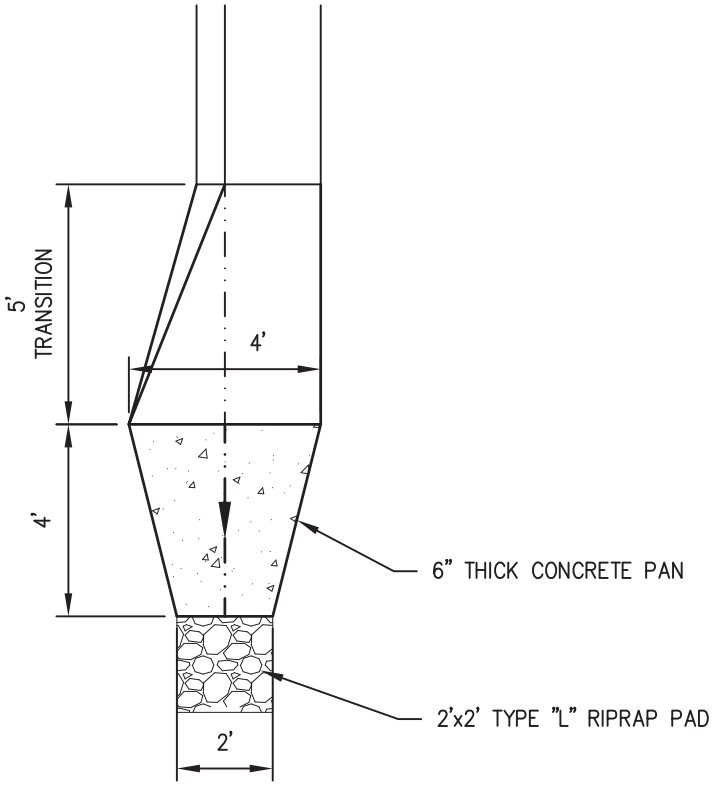
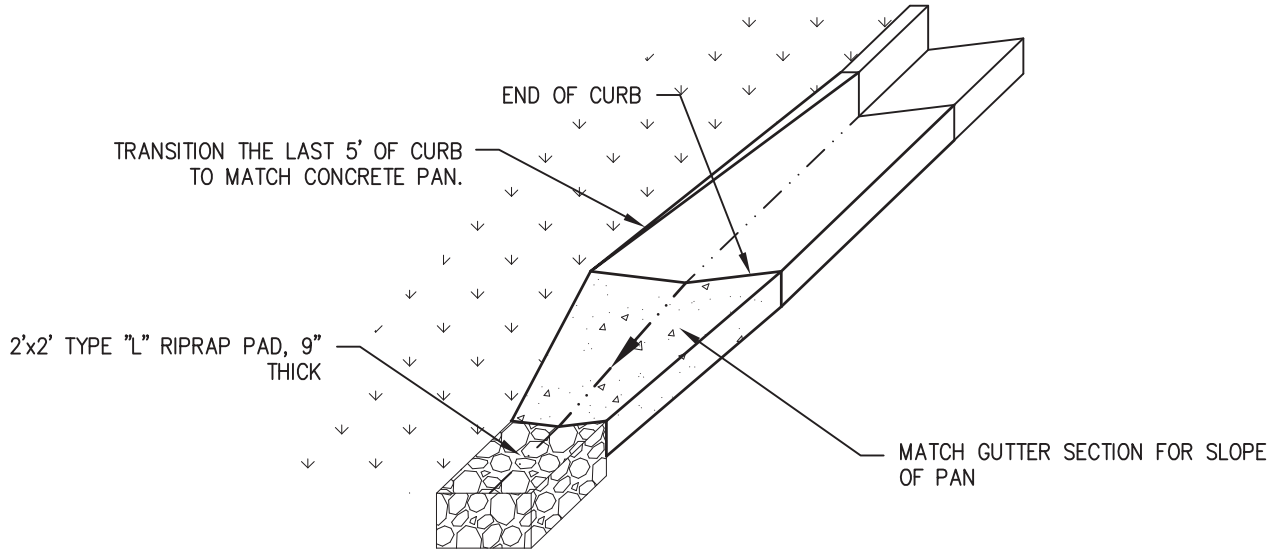
Drawing No. **SP.57**



PLAN



ISOMETRIC VIEW

NOTES:

ADDITIONAL EROSION CONTROL PROTECTIONSHALL BE SUBMITTED FOR COMMENTS.

EROSION CONTROL PROTECTION MUST BE PROVIDED TO TOP OF SLOPE OR NATURAL DRAINAGE.

CURB TRANSITION TO DITCH

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

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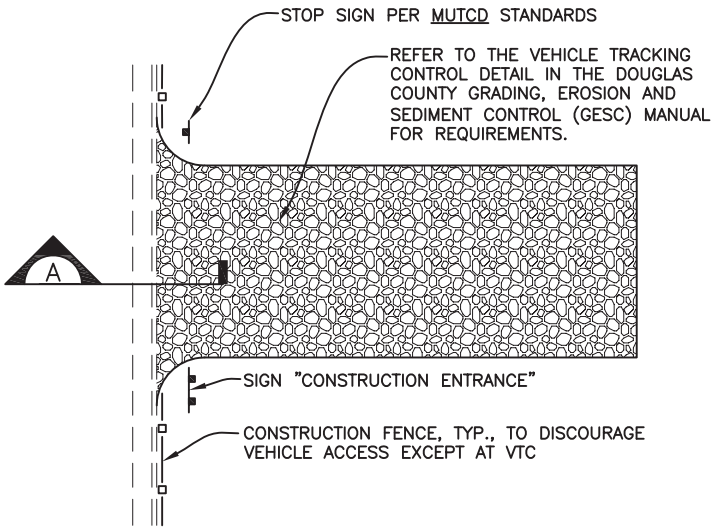
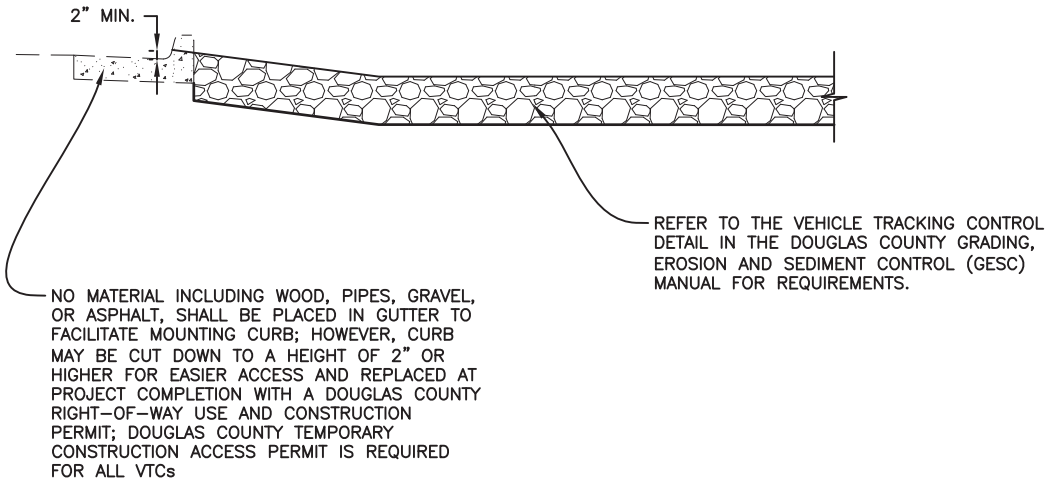
Drawing No.
SP.58



PLAN
SCALE: 1"=20'



SECTION A
SCALE: ¼"=1'-0"

VEHICLE TRACKING CONTROL INSTALLATION NOTES

1. VEHICLE TRACKING CONTROL PADS SHALL BE INSTALLED AT EVERY ACCESS POINT TO SITE.
2. ANY CRACKED OR DAMAGED CURB AND GUTTER AND SIDEWALK SHALL BE REPLACED BY PERMITTEE.
3. A DOUGLAS COUNTY TEMPORARY CONSTRUCTION ACCESS PERMIT IS REQUIRED FOR EACH ACCESS PERMIT.
4. A STOP SIGN INSTALLED IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), AS AMENDED, SHALL BE INSTALLED FOR EXITING TRAFFIC AT THE VTC.

CURB CUT

DOUGLAS COUNTY
COLORADO

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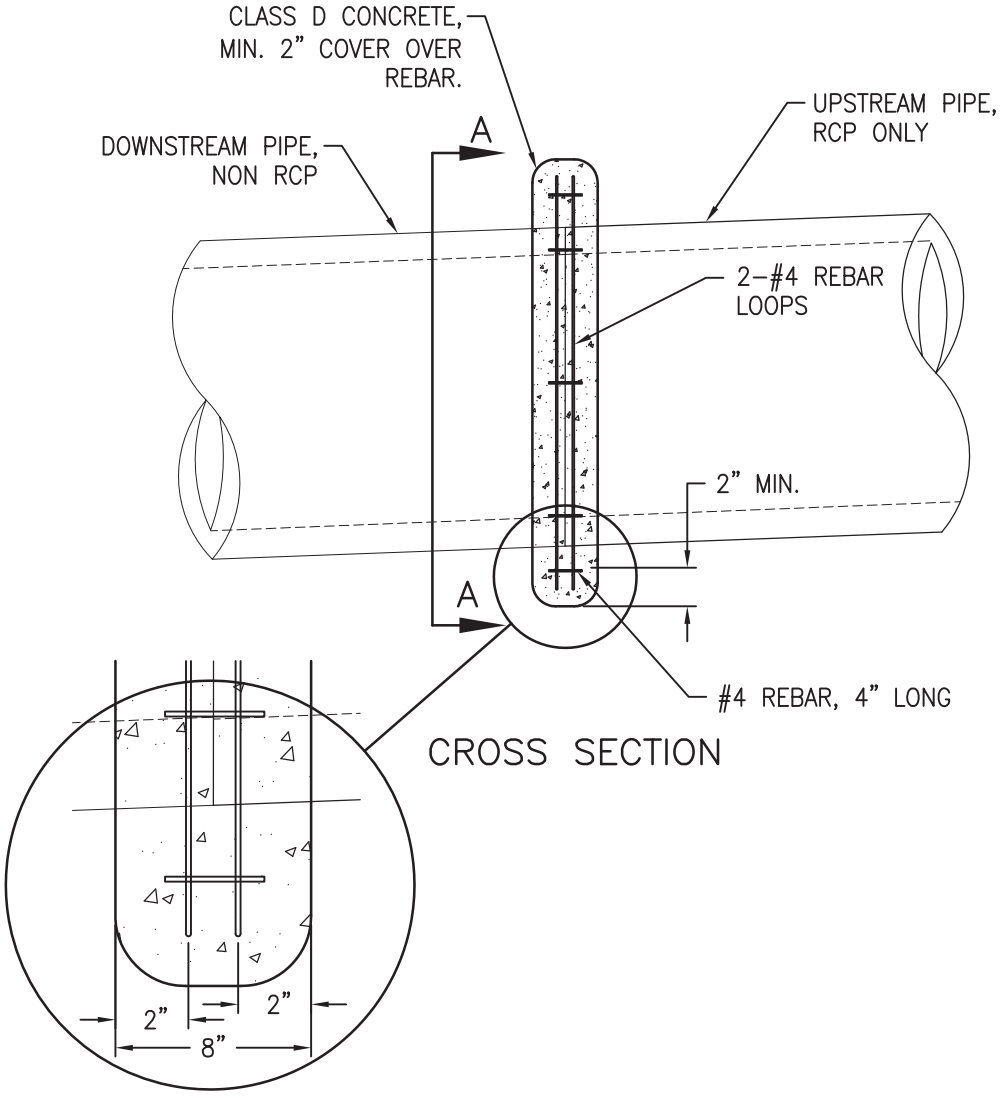
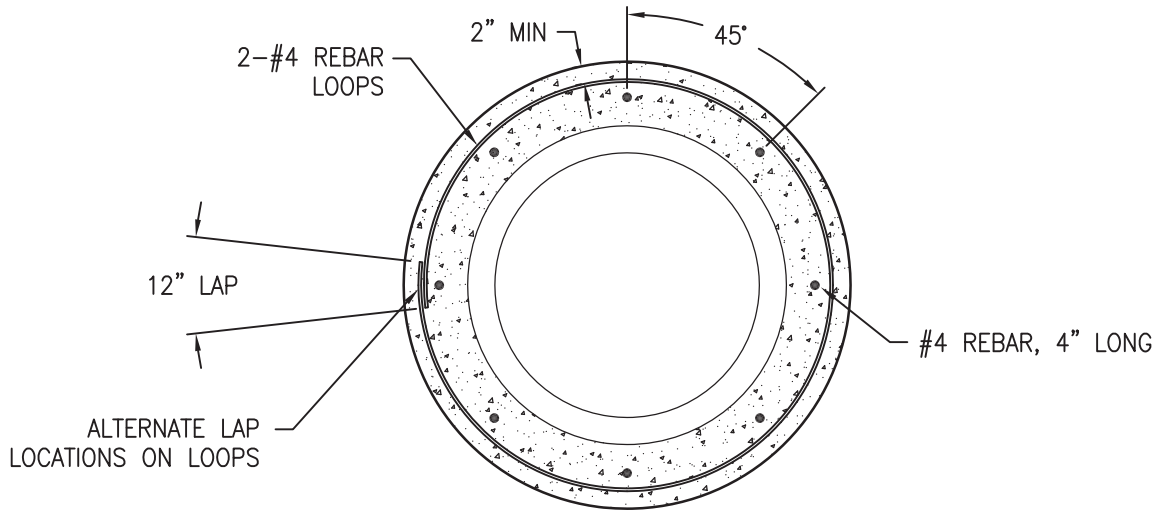
SP.59



CROSS SECTION



SECTION A–A

PIPE CONNECTION DETAIL TO EXISTING PIPE

DOUGLAS COUNTY COLORADO

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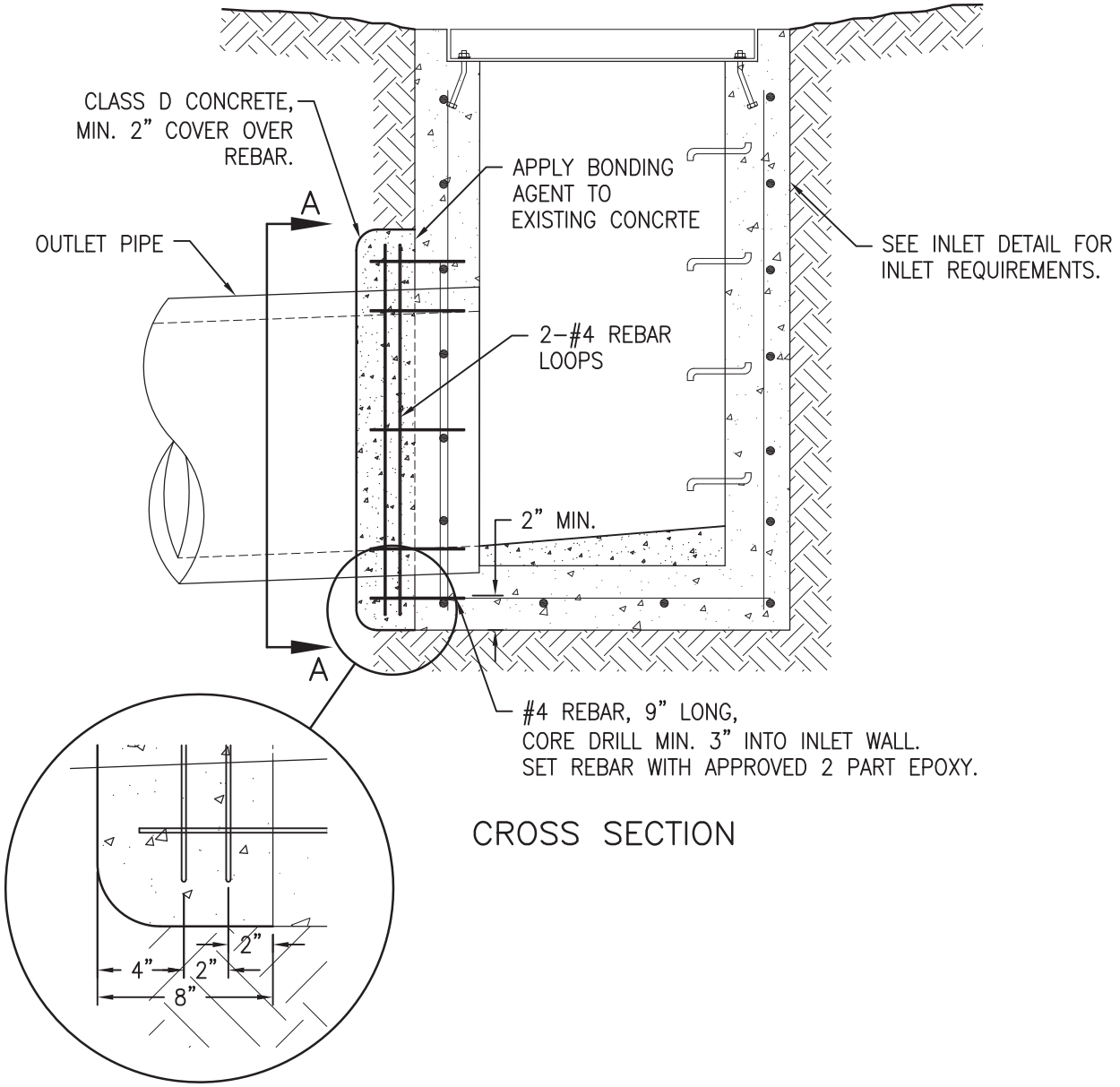
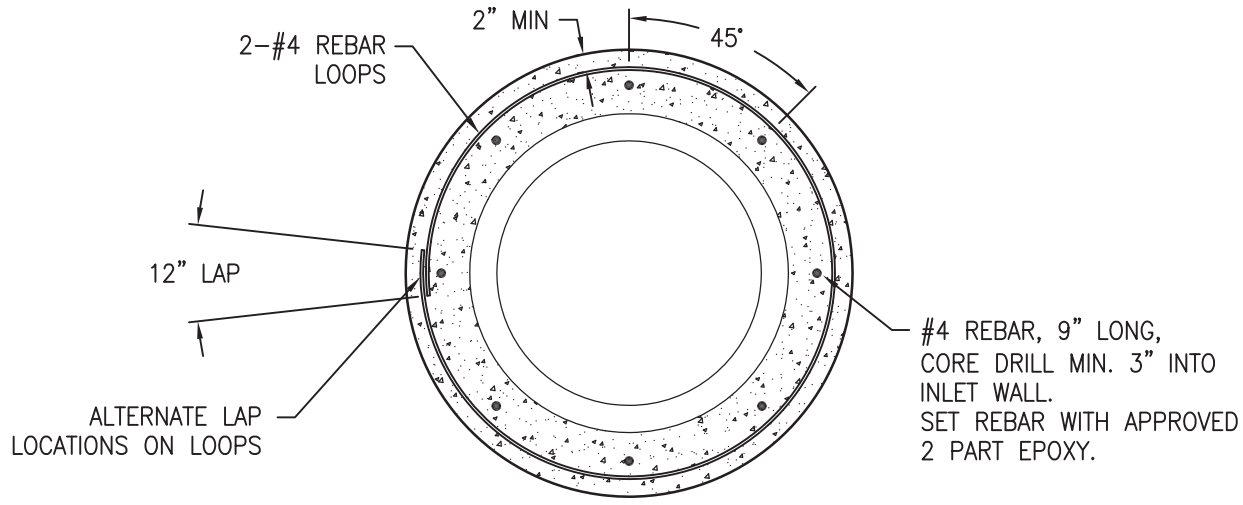
Drawing No. **SP.60a**



CROSS SECTION



SECTION A-A

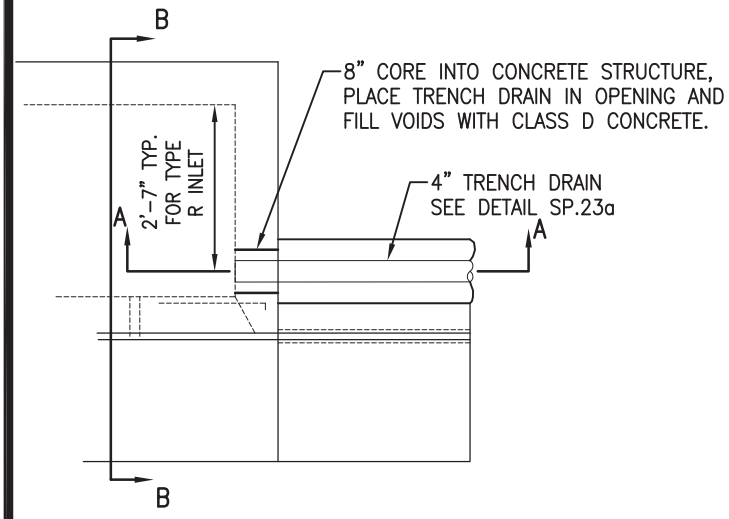
PIPE CONNECTION DETAIL TO EXISTING INLET

DOUGLAS COUNTY COLORADO

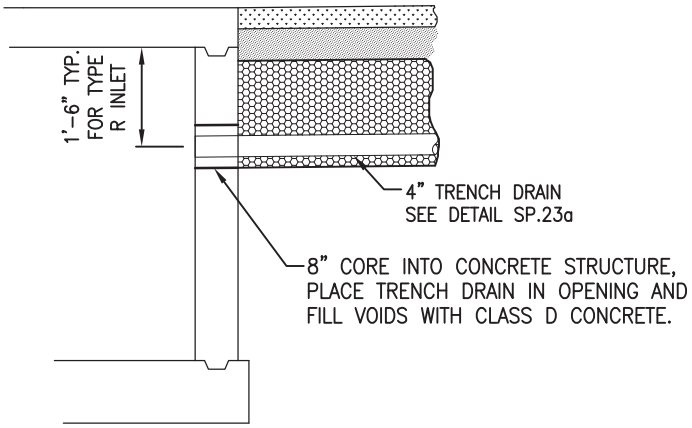
Issued: 05/2013

Revised:

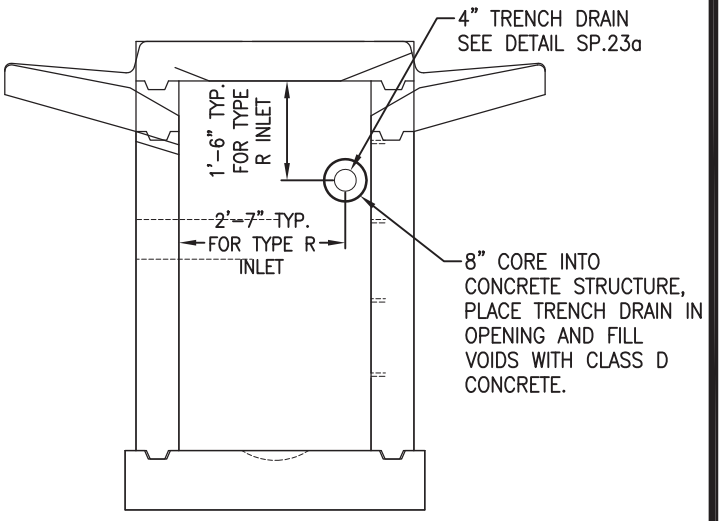
Drawing No. **SP.60b**



PLAN VIEW



SECTION A–A



SECTION B–B
END VIEW

TRENCH DRAIN CONNECTION TO INLET OR MANHOLE

DOUGLAS COUNTY
COLORADO

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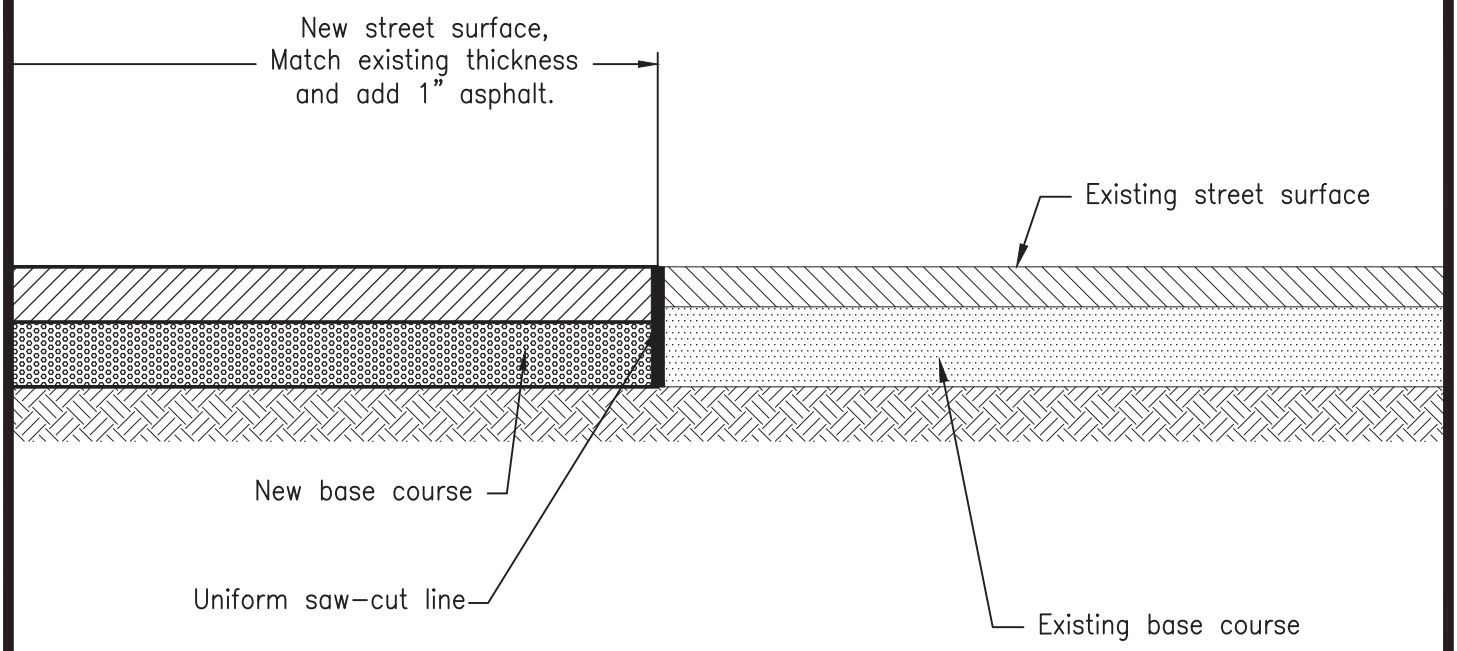
Revised: _____

Drawing No.
SP.61



NOTES:

1. This Street Cut/Patching detail specifies requirements in addition to those specified in the latest edition of the Colorado Department of Transportation's Standard Specifications for Road and Bridge Construction.
2. A Construction Traffic Control Plan shall be submitted to and approved by Douglas County prior to issuance of Construction Permits in the County Right-Of-Way.
3. Pavement edges shall be saw-cut and kept to a neat vertical edge prior to paving.
4. Edges shall be tack coated prior to patching.

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING

DATE 06/18/2021

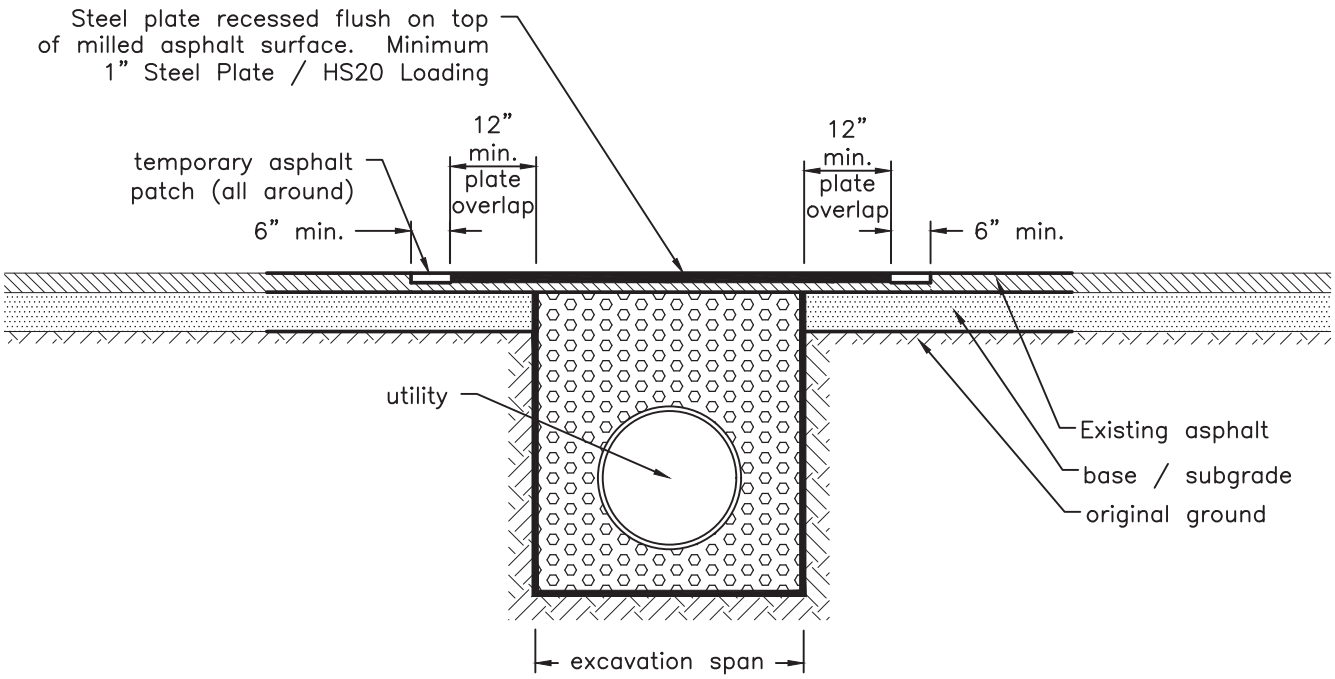
ASPHALT STREET CUT/PATCHING

DOUGLAS COUNTY
COLORADO

Issued: 05/2013

Revised: 05/2021

Drawing No.
SP.62



NOTES:

1. May only be used from May 15 to October 15.
2. Must have prior approval by Douglas County.

APPROVED BY DOUGLAS COUNTY

Janet Herman

JANET HERMAN, P.E.
DIRECTOR OF PUBLIC WORKS ENGINEERING
DATE 06/18/2021

TEMPORARY STEEL PLATE

DOUGLAS COUNTY COLORADO

Issued: 04/2020
Revised: 05/2021

Drawing No.
SP.63